MANUFACTURERS' PRACTICAL RECIPES

VOLUME II.

VARNISH AND VARNISH DERIVATIVES,

OILS AND OTHER VARNISH MATERIALS, OIL AND SPIRIT VARNISHES, PRINTING AND LITHO. INKS, ENAMELS, ANTI-FOULINGS, GOLD PAINTS, ETC.

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BY

LEWIS JAMESON

Assisted by Leading English and Foreign Trade Experts, Works Managers, and Skilled Mechanics.

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PREFACE TO VOL.

In this, the Second, volume of "Manufacturers' Practical Recipes" will be found an exhaustive collection of recipes, formulæ and working processes relating to Varnishes and Varnish Derivatives.

Primarily the work is based on "The Manufacturers' Practical Up-to-date Recipe Book," published by the same author in 1897. Four years, however, in such a progressive industry as that of modern varnish-making, have seen the growth of many new methods, the introduction of numerous novelties, and the discontinuance of not a few obsolete processes. Hence the scope of the present volume is much wider than that of the 1897 edition.

As the preparation of the new edition proceeded, it was found that to include the subject of Varnishes in the volume which deals with Colours, Paints and Paint Media would be attended with serious inconvenience. Accordingly, the highly important subject of Varnish-making was reserved for special treatment in the present volume, which also deals fully and practically with such derivatives of Varnish as Enamels, Anti-fouling Compositions, Printing Inks, Gold Paints, Coloured Lacquers, Varnish Stains and Hat Polishes, all of which have herein had ample attention bestowed on them, with the result that the Work will be found by Manufacturers, Merchants, Varnish-makers and Drysalters to

be a perfect compendium of accurate and pecuniarily valuable information on these highly technical and specialised branches of manufacturing industry.

Few industries are surrounded, in the eyes of the uninitiated, with such a halo of mystery as that of Varnish-making, and the reasons for this are various. In the first place, the industry is a very ancient one, and depended originally more on practical manipulative skill than on scientific principles. Secondly, the so-called secrets of the trade were jealously guarded. Each maker had his own recipes, which were often handed down from father to son, and were not communicated to any outsider, often, indeed, hardly committed to paper; and so the idea of mystery grew up. Thirdly, very many of the books and treatises on varnish-making have been the work of men who, whatever their qualifications as scientists may have been, were not in touch with the practical commercial requirements of the Trade. There has been a tendency in such publications, therefore, to omit just those details on which the manufacturer especially desires information.

All the points just alluded to have had due weight given to them in the present volume. The recipes have been carefully selected, and are given in great variety, full working instructions being included, so that time and money need not be wasted in discouraging and needless failures.

As regards the arrangement of the subject matter, care has been taken to begin at the beginning, the raw materials of varnish-making occupying attention in Chapter I. The preparation of the boiled oil used in the various classes of varnishes is, as the practical man knows, of the greatest importance; this subject, therefore, has been carefully dealt with. So also has that of *varnish driers*, especially the modern "resinates." Oil-boiling leads naturally to the preparation of the strongly boiled varieties, known as Litho Varnishes. A chapter which cannot fail to be of value has therefore been included, which deals with the preparation of Litho Varnishes and Printing Inks of all shades.

Among the leading classes of Oil Varnish which are treated in detail are Body and Carriage Varnishes, Copal Varnishes, Oak Varnishes, Japans, Gold Sizes, and Terebines, Black Varnishes, etc. Then follow Turpentine and Spirit Varnishes—a group which includes Polishes, Glazes, Lacquers, Varnish Stains, etc.

The section devoted to American Recipes is well worth attention, as it contains matter of a unique nature, and indicates how modern requirements are catered for by the up-to-date manufacturer in the sister continent.

That portion of the volume assigned to Varnish Derivatives treats of those products whose essential base is a specially prepared varnish, a distinction which serves to separate these products from paints pure and simple. Among the more important may be mentioned Enamels—both for decoration and for special uses, such as baths, metals, etc.,—Anti-fouling Compositions, Metallic, Copper, Bronze and Gold Paints, and other special products. These have all been treated in a most complete and practical manner, but readers who desire to make themselves acquainted with such materials from the "Paint" or "Colour" standpoint may find it repay them to familiarise themselves with the practical information contained in Vol. I.

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IMPORTANT NOTICE.

Although the greatest care has been exercised in the selection of recipes, formulæ, and processes, and in the revision of the proof sheets, and it is therefore confidently believed that errors in the text are neither numerous nor of serious importance, this volume of Manufacturers' Practical Recipes is offered on the distinct understanding that neither the Author nor the Publishers nor any other person concerned is to be held liable for any inaccuracies or errors, or for any loss or damage arising from any cause whatsoever in the working of any recipe or process herein described.

So much depends upon proper manipulation, suitable qualities of chemicals and materials, and correct working conditions (temperature, arrangement of plant, etc.), that it is absolutely essential that all recipes and processes be first tried experimentally on the smallest possible scale, and a satisfactory sample obtained before the operator attempts the preparation of a large batch.

It is proposed to embody any corrections, revisions, or additions that may be necessary in an ***Appendix,*** a copy of which will be presented to every purchaser of the present volume, and the Publishers will welcome suggestions from subscribers on matters relevant to the same.

LEWIS JAMESON and Co.

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PART I.

OILS, OIL VARNISHES, LITHO. VARNISHES, and PRINTING INKS.

CHAPTER I.

OILS, DRIERS, etc., IN VARNISH MAKING.

The oils used in varnish-making are practically confined to the class of the drying oils of which the following are the most important :—

Linseed Oil,
Walnut Oil,
Hempseed Oil,

With, recently, Chinese Wood Oil, or Tung Oil.

Cotton seed oil, castor oil, and certain fish oils are used to a limited extent also. The only oil, however, in the above list to which serious attention needs to be directed is linseed oil, which is, it may be said, an essential ingredient of every good quality oil varnish which is manufactured in quantity.

The raw oil must be carefully selected, and must be of undoubted purity. The sp. gr. should be as nearly as possible

·932 at 60° F., and it should be well tanked before use. It should contain no moisture or mucilaginous matter. The former causes the oil to froth unduly on boiling, while the latter manifests itself in the formation of a sediment when the oil is gradually heated up.

The first stage in varnish-making is the preparation of a suitable quality of boiled oil, and the exact consistency of this will depend to a great extent on the particular varnish it is desired to make.

The boiling of oil for varnish making is still largely conducted by fireheat, and in this particular, as well as in the choice of the driers used, will be found to be the chief difference between the process and that of boiling oils for painters' use, as described in Vol. I.

Driers used in Oil Boiling.

The choice of driers for boiling oil which is to form the base of oil varnish will necessarily depend greatly on the nature of the varnish it is desired to produce. Thus, for strong dark varnishes, driers may be used which communicate a considerable amount of colour to the oil, while for pale varnishes specially-selected driers must be employed.

The standard driers have long been dry raw umber in lumps, and some derivative of lead—either red lead, litharge, or sugar of lead. For an ordinary dark oil, umber and red lead would probably be selected; for paler and less powerful oils, litharge or sugar of lead would replace the red lead.

Sulphate of zinc or white copperas is also a favourite drier, and more recently compounds of manganese have found favour, noticeably the borate, and still more recently the linoleate. It is possible by means of these driers to prepare a boiled oil equal in drying power to the darkest oil, and yet hardly darker in colour than raw oil.

We will now proceed to give the processes by which grades of boiled oil suitable for different purposes in varnish-making may be prepared.

Boiled Linseed Oils.

(These oils are referred to under the various varnishes as A, B, C, etc.).

BOILED LINSEED OIL, "A" (FOR VARNISH-MAKING, ETC.).

Best Baltic Linseed Oil	120	gallons
Flake Litharge	21	lbs.
Dried Red Lead	7	lbs.
Dried Umber	21	lbs.

Measure the oil into a 150-gallon enamelled iron furnace, and put in the umber, which should be suspended just under the surface of the oil, in a wire cage. For the first three hours slowly heat up the oil to 350°—380° F., and during the next hour add the lead and litharge, a little at a time, with constant stirring; the temperature should now be raised to 420° F., and kept at this at least six hours, stirring well every half-hour, and then leave until next day. Next morning heat up to 400°—420° F., and continue boiling at this temperature eight hours longer; strain, and tank for use. It should be kept at least one month before using, but it is better to keep it three months if possible.

BOILED LINSEED OIL, "B." (FOR VARNISH-MAKING, ETC.).

Best Baltic Linseed Oil	120	gallons
Crude Black Oxide of Manganese (Washed and Dried)	21	lbs.
Calcined Sugar of Lead	14	lbs.
Pure Dried Borate of Manganese	14	lbs.

Measure the oil into a 150-gallon enamelled iron furnace, place the oxide of manganese in a wire cage, and suspend in the pan just below the surface of the oil. Light the fire, and during the first three hours gradually heat up the oil to 520° F., and keep at this temperature for five to six hours; then remove the oxide, draw the fire, and allow to cool down. Next morning, heat up the oil to 380° F., and add lead and borate of manganese;

the boiling must now be continued for seven to eight hours at 380°—400° F., with constant stirring; strain, and tank for at least one month before using; improves varnish if kept longer. The black oxide of manganese must be previously washed in cold water; it should be scrubbed with a hard brush to remove dirt and grit, and then dried in a pan over round hole fire. The borate must also be dried; this takes about 30 minutes at 200° F., and should be stirred up whilst drying.

BOILED LINSEED OIL, "C." (FOR COPAL, ETC.).

Best Baltic Linseed Oil	120	gallons

Measure the oil into 150-gallon enamelled iron boiler; light the fire, and during seven hours gradually heat up the oil to 500°—520° F. When this temperature is reached, continue boiling at the same for one hour, then draw the fire, and allow to cool until next morning, when it should be tanked for use; keep one month before using.

ORDINARY GENUINE BOILED LINSEED OIL, "D."

Ordinary Raw Linseed Oil	120	gallons
Dried English Umber	12	lbs.
Flake Litharge	10	lbs.
Dried Red Lead	7	lbs.

Measure or weigh the oil into 150-gallon iron furnace, suspend therein the umber in a wire cage, and during the first three hours heat up the oil to 350° F., and then add the lead and litharge, stirring all well in. After this, increase the temperature to 450°—480° F., and continue boiling at this seven hours longer, stirring well about every half-hour; strain, and tank for use.

For double boiled, the same quantity of oil and driers are used, and the boiling is continued next day for eight hours at 480°—500° F. These are sometimes reduced with boiled oil substitute according to price paid.

ORDINARY PALE BOILED LINSEED OIL, "E."

Ordinary Raw Linseed Oil	120	gallons
Best Calcined Magnesia	1	lb.
Flake Litharge	10	lbs.
Calcined Sugar of Lead	10	lbs.

Measure oil into 150-gallon enamelled iron furnace, and during first two hours heat up the oil to 300° F.; during the next hour add the magnesia, a little at a time. When all is in, commence to raise temperature to 400°—420° F., and add litharge and sugar of lead; when these are in, continue boiling at the same temperature five to six hours longer, giving a good stirring about every half-hour; strain, and tank for use.

("D" and "E" constitute fire-boiled painters' oils.)

GENUINE PALE BOILED OIL, "F." (FOR VARNISH, ETC.).

Best Baltic Linseed Oil	120	gallons
Best Calcined Magnesia	1½	lbs.
Pure Borate of Manganese (Dried) ..	21	lbs.
Calcined Sugar of Lead	5	lbs.

Measure the oil into 150-gallon enamelled iron furnace; during first two hours heat up to 300° F., and during the next hour add the magnesia, a little at a time, and then raise the temperature slightly, say to 320° to 330° F. and add borate and sugar of lead, and boil at this six hours longer, stirring well. Next morning, heat it up again to 320°—330° F., and boil at this eight hours longer, stirring well up every half-hour for five minutes. Following morning strain and tank. To be kept one month at least; longer standing will improve it.

"F." No. 2.

Best Baltic Linseed Oil	120	gallons
Best Calcined Magnesia	1	lb.
Sulphate of Manganese (Dried)	32	lbs.
Acetate of Lead (Dried)	5	lbs.

Measure the oil into a 150-gallon enamelled iron furnace. Heat up slowly to 350° F., and gradually add the magnesia during the next hour. Now reduce the heat to 310° F., and add the sulphate of manganese and acetate of lead. Boil up to 400° F., and continue four hours, stirring well. Next morning, heat up again to 340° F., and boil three hours. Tank for one month.

BOILED OIL SUBSTITUTE, "G."

Same as "H," using 60 gallons mineral colza or 100 gallons debloomed mineral oil.

BOILED OIL SUBSTITUTE, "H."

Ordinary Raw Linseed Oil	120	gallons
Flake Litharge	28	lbs.
Dried Red Lead	28	lbs.
Dried English Umber	28	lbs.
Mineral Colza	120	gallons

Measure or weigh linseed oil into 300-gallon iron furnace, and suspend the umber therein in a wire cage. During first two hours heat up the oil to 350° F., and then add the lead and litharge; stir well, and raise temperature to 480°—500° F., and boil at this for the rest of the day (say seven hours), giving it a good stirring up every half-hour, and then draw the fire. Next day, heat to same temperature, and boil and stir as previously for eight hours; allow to cool until following morning, and, while the oil is warm (about 150°—200° F.), pump in the mineral colza cold, and stir well; strain and tank. Must be kept one month, but improves if kept for three months before sending out.

BOILED OIL SUBSTITUTE, "I."

This oil is made in the same manner as the above, the only difference being the quantity of oil used.

Ordinary Linseed Oil	100	gallons
Flake Litharge	28	lbs.
Dried Red Lead	28	lbs.
Dried English Umber	28	lbs.
Mineral Colza	200	gallons

This oil is rather slower in drying than "H." "H" and "I" will mix with white leads, etc.

BOILED OIL SUBSTITUTE, OR WILL MAKE A SERVICEABLE LINSEED OIL VARNISH.

Rosin (Powdered)	2	cwt.	1 qr.
Kerosene	10	gallons	
Benzine	10	gallons	
Rosin Oil (S.S.2 Sandeman) ..	10	gallons	
Linseed Oil	5	gallons	
Brown Umber	$3\frac{1}{2}$	lbs.	
Borate of Manganese	$1\frac{1}{4}$	lbs.	
White Lead Acetate	1	lb.	

Melt down rosin, add last two to rosin, boiling for an hour. Tie umber (in lumps) in the usual bag or net, and suspend in the usual manner, letting down from time to time into the boil. Keep boiling until manganese is in, then cool down to 270° F., and add thinners, rosin oil first, then kerosene, benzine last and when much cooler.

RAW LINSEED OIL SUBSTITUTE.

(This is a resinate of lime product.)

Rosin (Pale)	2	cwt.	1 qr.
Air Slaked Lime (Powdered) ..	$12\frac{1}{2}$	lbs.	
Carnauba Wax	$1\frac{1}{2}$	ozs.	
Benzine	20	gallons	
Rosin Oil (S.S.2 Sandeman) ..	5	gallons	
Rosin Oil (R.R.5 Sandeman) ..	5	gallons	
Kerosene (Testefas)	5	gallons	

Run down resin; add lime in portions. When sediment falls, add shredded wax, and gently bubble for half-an-hour over moderate fire. Cool down, add rosin oil, kerosene next, benzine last, to prevent granulation.

CHINESE WOOD OIL (TUNG OIL) VARNISH.

Answers as a thinner, drier, etc., for oil colours or paints. Also good for enamels. Rather pale.

French Turpentine	150	lbs.
Chinese Wood Oil.....................	150	lbs.
Raw Linseed Oil (Substitute may be Used)	150	lbs.
Rosin Oil (R.R.6 Sandeman)	56	lbs.
Resin (Pale)	42	lbs.

Heat up raw oil to about 400° F., cool to 220°, then put in Chinese oil, but keep down heat, as latter is liable to jelly at high heats. Run down resin separately, add resin oil, add to other pan. When boiled and mixed together, cool and thin with Fr. turps. Good drier.

BOILED OIL SUBSTITUTE, OR CHEAP VARNISH.

Benzoline	10	gallons
Rosin Oil (S.S.2 Sandeman)	10	gallons
Resin	20	lbs.
Gum Thus	12	lbs.
Pale Boiled Oil	¾	gallon

Run down resin and gum thus, then add rosin oil, and boil up. Cool down, pour in boiled oil, and lastly the thinners. It is not high-class, but considering its low cost is very useful.

LINSEED OIL VARNISH, OR BOILED OIL SUBSTITUTE.

Sandeman's Rosin Oil V.W.	1	cwt.
Pale Resin	56	lbs.
"Scotch" Soda Crystals	22½	lbs.
Hot Water	5¾	gallons
Genuine Turps.	½	gallon
Manganese Resinate	2¼	lbs.

Dissolve soda in the water. With this saponify the resin previously powdered by boiling. Separate the soap, drain off water, and dissolve in the resin oil by heating. Strain, and then cool. Dissolve the manganese resinate in the turps., then add to the other. After standing best part of the week, strain through a fine sieve if necessary, and the article is ready for sale or use.

Other Mediums used in Varnish Making.

First in importance is American turpentine, one of the three constituents of the higher-class oil varnishes, the other two being linseed oil (already referred to), and gum resin. It is not often that American turpentine is purposely adulterated before it reaches the varnish-maker, but it should be tested all

the same. The colour, odour, sp. gr., volatility, and freedom from moisture should be carefully noted. The sp. gr. of American turps. is about .870 at 60° F.

French and Russian turpentines are also used to a certain extent.

If, as it is at times, turpentine appears to be watery, a small quantity of dry hot whiting or chalk lime should be sifted into it. This will carry the water down with it, and the sediment may be used in patent driers.

In spirit varnishes the medium consists as a rule of methylated spirit usually of 64 o.p. strength and supplied under certain excise regulations without the addition of mineral oil.

Ordinary methylated spirit contains—

Ethyl Alcohol (Spirits of Wine)	9	parts
Methyl Alcohol (Wood Naphtha)	1	part

Fusel oil or amylic alcohol is used in certain spirit varnishes, to which it imparts toughness and elasticity.

Name.	Formula.	Sp. Gr. at 60° F.	B.P.
Methyl Alcohol or Wood Spirit ..	CH_4O	.798	149.9° F.
Ethyl Alcohol or Spirits of Wine ..	C_2H_6O	.793	173° F.
Amylic Alcohol or Fusel Oil	C_5H_2O	.818	265° F.

Varnish Driers or Terebine Mixtures.

Under the above names are grouped various grades of boiled oil suitable for various classes of varnish and containing the suitable proportion of turpentine for the purpose for which they are required. After the gum has been run and has been thinned with a modicum of oil one or other of the mixtures referred to may be added to produce the finished varnish. They are also used as the base of terebines or liquid driers.

Process.—Heat the oil up to 550° F., and then sprinkle in the various driers, and keep the oil at 550° F. until all are dissolved. This can be ascertained by taking a sample from time to time, which must be clear and stringy, with little or no sediment. Cool down to 200° F., and add the turps. very steadily, away from any fire, stirring all the time. This should be put into tank, and when clear is ready for use in the varnishes.

STOUT QUALITIES USED AS DRIERS IN VARNISHES.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Red Lead		0	0	10
Litharge		0	0	10
Black Oxide of Manganese		0	0	10
Turpentine	50 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	24 gallons			
Litharge		1	0	0
Black Oxide of Manganese		0	0	10
Turpentine	60 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	30 gallons			
Sulphate of Manganese		0	0	10
Sulphate of Zinc		0	0	10
Litharge		0	0	20
Turpentine	60 gallons			

No. 4.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	0	10
White Sugar of Lead		0	0	3
Red Lead		0	0	10
Litharge		0	0	10
Turpentine	50 gallons			

No. 5.

		cwt.	qrs.	lbs.
Raw Linseed Oil	24 gallons			
Sulphate of Manganese		0	0	12
Litharge		1	0	0
Turpentine	60 gallons			

PALE QUALITIES.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	14
Sulphate of Manganese		0	1	0
Sulphate of Zinc		0	2	0
White Sugar of Lead		0	0	14
Turpentine	50 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	7
Sulphate of Manganese		0	0	7
White Sugar of Lead		0	0	14
Turpentine	50 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	18
Sulphate of Manganese		0	0	18
White Sugar of Lead		0	0	18
Litharge		0	0	18
Turpentine	50 gallons			

No. 4.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	1	7
Acetate of Lime		0	0	18
Litharge		0	2	0
Turpentine	50 gallons			

Various Special Driers used in Varnish-Making.

LINOLEATE OF MANGANESE.

Raw Linseed Oil	20	gallons
Caustic Soda	24	lbs.

Process.—Saponify the oil with a lye made from the caustic soda, about 30° B. Dissolve the soap by addition of hot water and add chloride or sulphate of manganese till the liquor is exhausted of soap. Wash on cloth filter and melt with gentle heat, and run into kegs to stock for use.

RESINATE OF MANGANESE.

	cwt.	qrs.	lbs.
Resin	0	3	14
Soda Lye, 30° Beaume ... 12 gallons			

Common or pale resin may be used according as pale or dark resinate is desired.

Process.—Make a soap of the resin and lye by boiling together. Dissolve the soap in boiling water, and pour in a solution of chloride of manganese or sulphate of manganese till the resin is all precipitated. Wash the precipitate on a cloth filter, dry and stock for use.

RESINATE OF LIME.

	cwt.	qrs.	lbs.
Pale Resin	1	0	0
Quicklime	0	0	16
Water *ad lib.*			

Process.—Slake the lime in a steam-jacket pan, add the resin, and boil the whole together till all water is evaporated. Fuse the resinate of lime produced at a gentle heat. Heat the powder when required for use.

LINOLEATE OF BARIUM.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Caustic Soda		0	0	24

Process.—As for linoleate of manganese, precipitating with barium chloride solution.

RESINATE OF BARIUM.

		cwt.	qrs.	lbs.
Resin		0	3	14
Soda Lye, 30° B.	12 gallons			

Process.—As for resinate of manganese, precipitating with barium chloride solution.

LINOLEATE OF MAGNESIUM.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Caustic Soda		0	0	24

Process.—As for linoleate of manganese, precipitating with sulphate of magnesia solution. Chloride of magnesia may be used, but the sulphate is recommended.

RESINATE OF MAGNESIUM.

		cwt.	qrs.	lbs.
Resin		0	3	14
Soda Lye, 30° B.	12 gallons			

Process.—As for resinate of manganese, precipitating with sulphate of magnesia solution. Chloride of magnesia may be used, but the sulphate is recommended.

LINOLEATE OF ZINC.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Caustic Soda		0	0	24

Process.—As for linoleate of manganese, precipitating with sulphate of zinc solution.

RESINATE OF ZINC.

		cwt.	qrs.	lbs.
Resin		0	3	14
Soda Lye, 30° B.	12 gallons			

Process.—As for resinate of manganese, precipitating with sulphate of zinc solution.

LINOLEATE OF COPPER.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Caustic Soda		0	0	24

Process.—As for linoleate of manganese, precipitating with sulphate of copper solution.

RESINATE OF COPPER.

		cwt.	qrs.	lbs.
Pale Resin		0	3	14
Soda Lye, 30° B.	12 gallons			

Process.—As for resinate of manganese, precipitating with sulphate of copper solution.

LINOLEATE OF LEAD.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Caustic Soda		0	0	24

Process.—As for linoleate of manganese, using sugar of lead solution to precipitate.

RESINATE OF LEAD.

		cwt.	qrs.	lbs.
Resin		0	3	14
Soda Lye, 30° B.	12 gallons			

Process.—As for resinate of manganese, using sugar of lead solution to precipitate.

Terebine Mixtures.

These are for sale as liquid driers, and not for use in varnish like those given previously. They are, however, direct products of a drying oil, and contain no gum like other terebines described further on.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Red Lead		0	0	10
Litharge		0	0	10
Black Oxide of Manganese		0	0	10
Turpentine	120 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	24 gallons			
Litharge		1	0	0
Black Oxide of Manganese		0	0	10
Turpentine	130 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	30 gallons			
Sulphate of Manganese		0	0	10
Sulphate of Zinc		0	0	10
Litharge		0	0	20
Turpentine	130 gallons			

No. 4.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	0	10
White Sugar of Lead		0	0	3
Red Lead		0	0	10
Litharge		0	0	10
Turpentine	120 gallons			

PALE.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	14
Sulphate of Manganese		0	1	0
Sulphate of Zinc		0	2	0
White Sugar of Lead		0	0	14
Turpentine	120 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	7
Sulphate of Manganese		0	0	7
White Sugar of Lead		0	0	14
Turpentine	120 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Borate of Manganese		0	0	18
Sulphate of Manganese		0	0	18
White Sugar of Lead		0	0	18
Litharge		0	0	18
Turpentine	120 gallons			

No. 4.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	1	7
Acetate of Lime		0	0	18
Litharge		0	2	0
Turpentine	120 gallons			

VARIOUS QUALITIES TO SUIT DIFFERENT TEMPERATURES.

FOR COLD CLIMATES.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	0	12
Sulphate of Zinc		0	1	7
White Sugar of Lead		0	1	0
Litharge		0	0	20
Turpentine	120 gallons			

FOR TEMPERATE CLIMATES.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	0	10
Sulphate of Zinc		0	1	5
White Sugar of Lead		0	0	25
Litharge		0	0	20
Turpentine	120 gallons			

FOR HOT CLIMATES.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Manganese		0	0	5
Sulphate of Zinc		0	1	0
White Sugar of Lead		0	0	18
Litharge		0	0	14
Turpentine	120 gallons			

CHEAP QUALITY.

		cwt.	qrs.	lbs.
Kauri Chips		1	1	0
Common Resin		0	0	14
Borate of Manganese		0	0	14
Red Lead		0	0	14
Boiled Linseed Oil	5 gallons			
Turpentine	40 gallons			

PALE (CHEAP QUALITY).

		cwt.	qrs.	lbs.
Orange Shellac		0	1	20
Pale Resin		0	1	20
Litharge		0	2	0
Raw Linseed Oil	12 gallons			
Turpentine	100 gallons			

NOTE.—The foregoing are inserted here for the sake of comparison. Details of process are given on page 72.

Linseed Oil Liquid Driers.

COLOURLESS.

No. 1.

		cwt.	qrs.	lbs.
Resinate of Manganese		0	0	7
Resinate of Lead		0	0	14
Resinate of Lime		0	1	0
Pale Boiled Linseed Oil	7 gallons			
Turpentine	60 gallons			

No. 2.

		cwt.	qrs.	lbs.
Resinate of Lime		0	1	0
Turpentine	20 gallons			
Coarse Powdered Glass		0	1	0

Process.—Melt the resinates in the oil, with gentle heat, and warm the turps., mix well together, strain through a hair sieve. Allow to settle for a few days, and draw off the clear liquid. The sediment may be ground in patent driers or in any of the paints.

The powdered glass used in No. 2 is to prevent the resinate of lime from coagulating. The glass settles out and can be used repeatedly.

STRONG DARK.

		cwt.	qrs.	lbs.
Resinate of Manganese		0	1	0
Resinate of Lead		0	0	12
Boiled Linseed Oil	4 gallons			
Turpentine	40 gallons			

Process.—Melt the resinates in the oil, warm the turps., and mix well together, strain, and pack for use.

THIN.

		cwt.	qrs.	lbs.
Linoleate of Manganese		0	1	0
Linoleate of Lead		0	1	0
Turpentine	40 gallons			

Mix well together.

Varnish Mixtures or Bases.

NO. 1.

SUITABLE FOR VARNISHES, GOLD SIZE, TEREBINE, ETC.

Linseed Oil	26	gallons
Red Lead	25	lbs.
Zinc Oxide	8	lbs.
Litharge	½	lb.
Bichloride of Mercury	¾	oz.
Turps.	8	gallons

Put all, except turps., into pan, heat up to 400° F., until thick, then strain, and add turps. when cooler. The amount of turps. may be varied according to special uses.

NO. 2.

MORE ESPECIALLY FOR TEREBINES (DARK).

Linseed Oil	30	gallons
Turps. or Good Substitute	15	gallons
Red Lead	28	lbs.
Zinc Oxide	10	lbs.
Litharge	5	ozs.

Boil thick, adding turps. afterwards when cooler. Thinned with petroleum or resin oils would make a good boiled oil. Dries quick, and is glossy.

New Process Boiled Oils.

By regulating the amount of turps., resin, oils, spirit, benzine, or petroleum used, these mixings will produce—

Boiled Oils,
Drying Oils,
Oils for Driers' Bases,
Gold Sizes,
Terebines, etc.

No. 1.

DARK, THICK.

Linseed Oil	17½	gallons
No. 3 x x Kauri Gum	56	lbs.
Manganese Oxide (Granules)	4¾	lbs.
Red Lead	7	lbs.
Litharge	3	lbs.
Dry Burnt Umber	3	lbs.
Garnet Lac Crumbs	3	lbs.
Turps. (according to use)	10 to 40	gallons

Melt down kauri gum, which fuses at 509° F.; heat up oil to 500° F., then run in. When mixed, drop down to 400° F., add manganese, and, after this has boiled in, sprinkle in the lead and litharge, and continue boiling at the same temperature for 35 minutes. Add umber, and shellac, raise heat to about 500° F. When gums are dissolved, let down the heat, cool, and thin out as required. For a Japan (grinding) the full amount will be wanted. For terebine driers 30 gallons; gold-sizes 20 gallons; varnish 28 gallons, and similarly with others.

No. 2.

PALE, SPECIALLY SUITABLE AS TEREBINE.

Settled Old Raw Oil	18	gallons
Resin Spirit	10	gallons
Turps.	10	gallons
Rosin Oil (R.R.6 Sandeman)	10	gallons
Rosin Oil (B.S.5 Sandeman)	10	gallons
Borate of Manganese	13½	lbs.
Litharge	12½	lbs.
Kauri Dust	24	lbs.

Heat up oil (linseed) to 350° F., turn in litharge in portions, well stirring, and beating down if signs of boiling over. When thick, add the borate and heat up higher, say, 525° F.—550° F., when the fire may be put down. As manganese, when added to boiling oils, causes them to rise up and also increases the temperature very much, it is best to only add this very gradually. When a sample, cooled, will crack like toffee, the boiling is finished, and the kauri gum is added. The heat of the oil should melt this, but, if requisite, the fire must be again employed. When gum has all dissolved, cool down, and add thinnings, resin oil first, then turps. and resin spirit.

Benzine Drier.

Said to be a very excellent drier.

30 lbs. kauri dust melted in separate kettle. 18 gallons raw linseed oil, heat, and add slowly—

Red Lead	24 lbs.
Litharge	24 lbs.
Black Oxide Manganese	15 lbs.

When kauri is thoroughly melted and in condition, pour into kettle, with oil and driers. Cook till mass when sample cooled snaps short off. Then add 147 gallons benzine.

Special Boiled Oils and Oil Derivatives.

There is now a large trade in special oil derivatives, rubber substitutes, or compounds, like oxylin, which are made up into goods such as pegamoid wallpapers and relief decorations, linoleum, oil cloth, canvases, etc., etc. These very valuable compounds may be produced by adding any selected metallic resinate or oleate to linseed oil, and heating together to a high temperature. The amount of resinate will depend upon the further uses of the compound, and the consistency required, so this is a simple matter. The product is suitable for a linseed oil varnish alone or with an admixture of gums, etc. In the preparation of rubber-like substances, compounds may be made of almost any degree of elasticity by oxidising the oil or varnish by blowing air through until it acquires the degree of viscosity, consistency, or toughness required.

Further, petroleum, resin oils, etc., may be added to thin out the mixture to form artificial linseed oils, and, as these dry very quickly, they may be sold as boiled oils, or drying oils, yet are pale enough to sell as raw oil. For insulating compounds, rubber substitutes, etc., various substances are added as a base or filler at will. For cables and insulating materials, glue and glycerine solution, slate dust, or a portion of real rubber (cut small and dissolved in oil, hot) may be used.

For linoleums, cork dust and wood or paper pulp, while for wall-paperings, like Lincrusta Walton and Oxylin, paper and wood pulp, earthy matters, like whiting, clay, or barytes are suitable.

GLOSS OILS, COACH OILS, ETC.

In the chapter devoted to American recipes will be found numerous formulæ for these and similar goods.

CLARIFIED OILS.

These oils are specially prepared for use in varnish making, and are quite distinct from boiled oils. They may be used in any of the varnish forms given, these taking the place of the ordinary matured raw linseed oil.

No. 1.

	cwt.	qrs.	lbs.
Baltic or Ordinary Raw Linseed Oil 100 gallons			
Burnt Umber	0	1	0

Process.—Boil the oil gently for an hour or two. Dry the umber, and heat it to 200° F., carefully put into the oil, stirring well. Boil another hour or two, and run into tank to settle. The clear oil should then be drawn off, and the sediment of umber and mucilage, etc., use in the manufacture of paints.

No. 2.

	cwt.	qrs.	lbs.
Baltic or Ordinary Raw Linseed Oil 100 gallons			
Calcined Magnesia	0	0	2

Process.—Boil the oil gently for an hour or two. Calcine the magnesia, and, while hot, sift into the oil. Boil up again for an hour or two, and run into settling tank. This will take a month

or two to settle, but will be clear and pale, fit for the palest of varnishes. If wanted quicker, heat 56 lbs. of powdered glass and sift into the oil. This will settle in a day or two, and will carry the magnesia down with it, the sediment being used in the manufacture of stiff paint.

NO. 3.

Baltic or Ordinary Raw Linseed Oil ...	100 gallons
Powdered Whiting	10 lbs.

Process.—Warm the oil, and, after it has simmered an hour, run off to settling tank. The whiting, heated up to 200° F., should then be sifted into the oil. It will absorb mucilage, etc., and settle down in a few days. This is a quick and cheap method of clarifying oil for cheap varnishes, the sediment being used in the manufacture of stiff paints.

DRYING OIL.

Raw Oil	45 gallons

Boil for two days, for the first day at 400 degrees, and the second day 500. Add 50 lbs. of litharge and 30 lbs. white copperas, and stir well until all is dissolved.

Sundry Varnish Oils.

The following special boiled oils are used extensively in varnish making, and will be referred to in the pages of this volume.

QUICK OIL.

Raw Oil	150 gallons
Litharge	75 lbs.
Umber	35 lbs.

Get pot up to 320°, then add litharge. Carry up to 380°, then finish.

REFINED OIL.

Raw Linseed Oil	150 gallons
Umber	35 lbs.

Get heat up quickly to 370° to 400°.

POLISH OIL.

Gradually thicken refined oil by raising heat. The consistency of varnish should be arrived at. Be careful when heat reaches 580°.

THIN OIL.

Raw Oil .... 150 gallons

Suspend in iron basket in pot 40 lbs. black oxide of manganese, in lumps. Heat up to 280° for two hours to kill the foots, then raise to 400°, when process should be finished. If carefully boiled, oil should be quite pale.

PALE QUICK OIL.

Same as quick oil, using 2, 4, or 6 oz. litharge to each gallon of oil.

THIN PRIMA OIL.

Raw Oil .... 150 gallons

Heat to 300°, then add levigated umber in lumps, ¼ lb. per gallon. Work the umber well into the oil. Heat up to 400° for five hours, when finished.

THICK PRIMA OIL.

Thin Prima .... 100 gallons

Allow to brighten, then thicken at 560° to 580°.

General Process of Varnish-Making.

OIL.

Reference has already been made to the selection and treatment of raw linseed oil which is to be used for varnish making. A few leading points may be repeated.

A good, pure raw linseed oil is necessary; some makers use exclusively the oil obtained from Baltic linseed, and called, in the trade, Baltic oil. There is no doubt that Baltic oil possesses some qualities which render it superior for varnish making to the ordinary run of oils, but, nevertheless, fine varnishes can be made with the ordinary oils. Prior to being used for varnish making, the oil should have stood in tanks until quite clear. This settling and ageing process requires no chemicals, and must be made a

standing order in varnish factories if reliable varnishes are to be turned out.

Before mixing the various chemical materials with the oil, they must have been previously thoroughly dried. This is best done in shallow trays, thus exposing all to the action of the hot air in the drying room. This process is best done immediately previous to using, as, if left about, they are liable to absorb moisture from the air.

Too much attention cannot be paid to this matter, as at the high temperature of the oil, when the chemicals are added, any moisture contained would be immediately converted into steam, with dire results, and undoubtedly severe injury to the varnish maker.

STORAGE OF GUMS.

All gums and resins must be stored in a dry and fairly warm warehouse, and previous to use in the varnish works should be broken to small pieces of a uniform size. This greatly assists the proper fusing or running of the gum. Most of the gums may now be bought ready broken by machinery, but the admixture of commoner gums is not then so readily detected as when it is in larger pieces. By buying through reliable merchants, this drawback should not, however, be felt. It is much more convenient to buy the gum ready broken.

THEORY OF VARNISH MAKING.

Oil varnishes, the most durable and lustrous of these products, are composed of a mixture of gum, oil, and spirits of turpentine. The oil used is linseed oil, and the gums chiefly copal, animi, and kauri, with various resins in the cheaper grades. The drying property of the oil having been increased by the addition of various lead or manganese salts, and a judicious selection of gum made, it is well to bear in mind the following precautions before proceeding with the manufacture of varnish.

1.—That the oil varnish is not a solution, but an intimate mixture of gum, oil, and turpentine.

2.—That the gum must be completely fused previous to the addition of the oil.

3.—That the oil must be heated from 250° to 300° F.

4.—That the spirits of turpentine must be added gradually and in a thin stream while hot, and while the mixture of gum and oil is still hot, and as the final stage in the mixing.

Preferably the heating vessels should be of copper, but, in practice, it is usual to use light enamelled iron vessels, with copper bottoms, the bottom being riveted on. To promote the admixture of the gum and oil, the gum, carefully selected and in small pieces of uniform size, is separately heated with continual stirring, coke being used as fuel. Good management is required to prevent the gum from being burnt, and so becoming dark coloured. When completely fused, the heated oil should gradually be poured in, with constant stirring. The turpentine, previously heated, is added in a thin stream to the former mixture, care being taken to keep the heat of all parts as high as is consistent with safety. This latter operation must be conducted away from any fire or flame. Proper attention to all these directions must be given, and of only a thoroughly experienced and competent workman can good results be expected.

GUMS AND RESINS.

The properties of these bodies are somewhat complex, and considerable experience is necessary before one can handle them with perfect satisfaction.

All hard resins have to be subjected to a process of fusion and partial distillation before they become soluble in the varnish mediums—oil and turps.

As a rule, therefore, they are cooked till they lose about one-fourth of their weight.

Hard copals melt at about 320° C., and distil at about 350° C.

Amber melts and distils at about 35° C. below these figures, while medium copals melt and distil at 180° and 225° C. respectively. Damar melts at 150°, and mastic at 150° to 180° C.

Leppert gives the following as the loss in weight by distillation necessary to make the resins soluble .—

	Per cent.
Manilla, Hard Dust	11·7 to 13·3
Manilla, Lumps	14·6 „ 15·8
Manilla	12·3 „ 16·5
Angola, Red, Crude	21·6 „ 16·6
Angola, Washed	16·6
Sierra Leone	17·2
Zanzibar	32·0
Amber	30·0

INSTRUCTIONS FOR THE GUM WORKINGS FOR ALL VARNISHES.

Fuse the gum in a copper pan until it is completely liquid, then take it from the fire, and have your oil as near the same temperature as the gum as possible. Add the oil to the gum. After the oil is added, place the mixture again on the fire and add the driers, and stir well till all are dissolved. Take off the fire and let cool, then add the turpentine, and let stand for three or four weeks to settle.

The following notes are from a thoroughly practical source :—

The gum must first be melted alone till quite fluid, and then the clarified oil is poured in very slowly ; the mixture must be kept over a strong fire until a drop pinched between the finger and thumb will, on separating them, draw out in strong filaments. The pot is then taken off for 15 or 20 minutes, after which the turps. is poured in, being carefully stirred near the surface. Copal varnish should be kept about three months before using ; the more thoroughly gum is fused the stronger the varnish, and the greater the quantity a given weight will produce ; the longer and more regular the boiling the more fluid the varnish. If brought to the stringy state too quickly, more turps. will be required, which makes the varnish less durable.

CHAPTER II.

PRINTING INKS AND LITHOGRAPHIC VARNISHES.

Of the many derivatives of boiled linseed oil, none are of greater importance, from a commercial and technical point of view, than the substances known generally as printing inks and lithographers' varnish. These bodies are neither inks, varnishes, nor paints in the ordinary acceptation of these terms, and yet they partake of the nature of all three. As their base is essentially linseed oil, boiled in a special manner, we shall proceed by giving the methods by which the foundation of the articles now under consideration is prepared.

Oil for Lithographers' Varnishes.

Pump 40 gallons of raw linseed oil into copper, then swing a thermometer into this; start the fire, and, when the glass registers 500° (which will take about four hours), draw fire, and leave to cool till next day. This is the bleaching process.

Get this out of copper and leave to settle four days before using for varnish. Draw off the clear oil, and charge copper with same, swing thermometer in again, start the fire, and let burn gently for four hours, when the temperature should be between 570° and 580°. Keep temperature at 580° for four hours, when the fire can be drawn.

This will be a *tint litho.*

For Thin Litho.	1½	hours	longer	boiling
„ Medium Litho.	3	„	„	„
„ Strong Litho.	4½	„	„	„
„ Extra Strong Litho.	6	„	„	„

ANOTHER METHOD.

No. 1.

Best Baltic Linseed Oil	120 gallons
Best Calcined Magnesia	$2\frac{1}{2}$ lbs.

Measure oil into 150-gallon enamelled iron furnace, and, during first three hours, slowly heat up the oil to 320° F., and then add the magnesia during the next hour. Then, during the following four hours, gradually raise the temperature to 500°—520° F.; keep it at this for one hour longer, and then draw the fire. Tank in the morning, and leave one month to settle.

No. 2.

May be made in an enamel iron furnace, or, what has been found more preferable, in a movable varnish boiler of about 40 gallons capacity, the bottom and five or six inches up the side being of $\frac{1}{8}$ inch copper, and the body of hard sheet iron enamelled. Measure 30 gallons oil into boiler, and place it over the round hole fire. During the first hour, run the oil up to 320° F., and then remove from the fire. When slightly cooled, replace over the fire, heat to 350°—360° F. and again remove; when cooled again, replace as before, and heat to 400° F. This process must be repeated, raising the temperature about 20°—30° F. each time, until it reaches 560°—580° F. When this is reached, keep on the fire until thick enough. Three sorts of the above are generally made, viz., thin, medium, and thick. Each time the boiler is removed from the fire, the vapour should be well beaten out.

Oil for Printers' Varnish.

Raw linseed oil is boiled at a high temperature—600° F.—until fumes cease to come off. This must be done with constant stirring. The varnish is finished when a sample taken out is thick when cool. This is practically the same as litho. varnish, but is made in one operation. Neither in printers' nor litho. varnish are driers added.

Varnishes for Letterpress and Lithographic Inks, Etc.

In the following pages are given formulæ, with practical details, for the making of the oil base or varnish, and the tinting of the same, for various classes of work.

THIN.

Process.—Place in 100-gallon boiler 80 gallons of the best Baltic linseed oil. Light up fire and raise the temperature to 420° F. Now add gently 1 lb. of magnesia, draw fire, and allow to cool down. Now pass through fine muslin, taking care to free from all particles of fat or grit in the oil. After straining into casks, run into the finishing-boiler and light up the fire, raise temperature gently, taking care not to agitate or stir the oil in any way. When temperature is up to about 200° F., skim off as quickly as it forms the scum and skin that rise on the oil, and raise up heat to 520° F. Keep at that for 10 hours. Then draw fire and strain once more into settling tank. This will now be a paler and brighter tint than at the beginning. The greatest attention must be paid to clearing the oil from the dark skin that arises, otherwise it will discolour the whole batch and cause bad results.

MIDDLE.

The process for this is exactly the same as for thin, but boil at 530° F. for three days. Strict attention is required for this when once the heat is up. It must be kept at a uniform heat the whole time, and the fire kept steady and slow, not too fierce.

STRONG.

Same as above, but boil for quite six days, 10 hours a day.

TINT OIL.

Same as for thin, but boil six hours at 500° F.

THIN BURNT.

Process.—Light up fire and place in pot 40 gallons of previously just heated oil (as per process for thin). Then boil up to 520° F. Now increase heat slowly up to 600° F. Then have long iron rod heated to almost white heat, and swing pot from under fire and place under fume chimney, and pass hot rod into oil, when firing will result. Watch until the flame burns blue, then continue the burning for one hour.

Great care must be taken in firing the oil to place rod into the oil as quickly as possible whenever it is ready, and never get too quick a heat under pot first. Also keep clearing the oil from the skins that form on top.

MIDDLE BURNT.

Same process as above, but burned for 2½ hours instead of one. Run into the oil, when burned, 1 oz. of lard to the gallon of oil. This makes free working when mixed with inks (colour).

STRONG BURNT.

Same as for thin and middle, but burned for 3½ hours.

BLUE VARNISH.

Raw Linseed Oil previously heated ...	100 gallons
Pale French Rosin	20 lbs.
Soap	1 lb.

Exactly same process as for thin burnt, but fired for 1 hour 55 minutes.

RED VARNISH.

Same as for middle. On second day of heating, add 1¾ lbs. of white soap to the batch of 100 gallons, and 2½ lbs. of pale French rosin at every heat (heat three times).

THIN POSTER.

Raw Linseed Oil	50 gallons
French Rosin	25 lbs.
White Tallow Soap	4 lbs.

Process.—Place oil in, first heating boiler, raise heat up to 420° F. Draw fire and strain, then run into boiling pan and add gradually the rosin. Now raise heat up to 500° F., and, when at that, add gradually the soap, then boiling up to 550° F. for 10 hours.

MIDDLE POSTER.

Same process as for thin poster, but the following formula :—

Raw Linseed Oil	50 gallons
Pale French Rosin	58 lbs.
White Tallow Soap	7 lbs.

Keep heat at 540° F. for two whole days.

STRONG POSTER.

Same process as for thin and middle, but using the following formula :—

Raw Linseed Oil	50	gallons
Pale French Rosin	95½	lbs.
White Tallow Soap	14	lbs.

Boil at 540° for five days.

MEDIUM TINTING.

Thin Boiled	52	gallons
*Tint White	52	gallons
Pale Gold Size	6	gallons

* Tint White is Hydrate of Alumina.

PALE BRONZING PREPARATION.

Middle Boiled	35	gallons
Strong Burnt	3½	gallons
Acetate of Lead	8	lbs.
Tint White	7½	lbs.
Medium Tinting	7½	lbs.

DARK BRONZING PREPARATION.

Middle Boiled	35	gallons
Strong Burnt	10	gallons
Burnt Umber	36	lbs.
Gold Size	2	gallons
Borate of Manganese	6½	lbs.

MEDIUM BRONZING PREPARATION.

Middle Boiled	20	gallons
Strong Burnt	10	gallons
Orange Chrome	14	lbs.
Burnt Umber	3	lbs.
Sulphate of Zinc	3	lbs.
Borate of Manganese	5	lbs.

Printing Inks.

The general term printing inks is employed to designate the substances prepared by grinding one or other of the varnishes described in the preceding paragraphs with a specially selected colour. Thus we have, according to the purpose for which the ink is required, poster inks, news inks, label inks, letterpress inks, and litho. inks.

The process of grinding the colour with the varnish is the same in each case, except that in the commoner inks, such as those for poster, news, and jobbing work, the same fineness of grinding is not necessary as in the case of the fine litho. inks. Chilled iron roller mills are usually employed, and the ink must be passed through repeatedly till a fine smooth product is obtained. Stone rollers have recently been adopted for this class of work, and if they can be got to turn out the work fine enough they will effect a great saving, as they get through so much more work than the iron mills.

The following are examples of poster and news inks :—

BLUE POSTER.

	lbs.
Ultra. O O A Blue	28
Thick Litho.	11
Thin	5
Soap	$1\frac{3}{4}$

PALE BLUE POSTER.

	lbs.
Ultra. O O A Blue	28
Paris White	10
Thick Litho.	$12\frac{1}{2}$
Thin	5
Soap	$1\frac{1}{2}$

AZURE BLUE POSTER.
No. 1.

	lbs.
Blue Varnish	58
Middle Boiled	14
Ultra. Blue, Best	32
Ultra. Blue, No. 1	58

No. 2.

	lbs.
Blue Varnish	58
Middle Boiled	14
Paris White	7
Ultra. Blue	72

½ oz. of ink driers to 1 lb.

ROYAL BLUE POSTER.

No. 1.

	lbs.
Blue Varnish	30
*Pine Varnish	13
Ultra. Blue, Deep	38
Paris White	5

* Pine Varnish (also called Bright or Rosin Varnish) is Rosin dissolved in drying Rosin Oil.

No. 2.

	lbs.
Blue Varnish	30
Pine Varnish	17
Ultra. Blue, Deep	38
Paris White	10

1 oz. of driers to 1 lb.

FLAKE WHITE POSTER.

No. 1.

	lbs.
Middle Boiled	24
Flake White	80
Tint White	8

No. 2.

	lbs.
Middle Boiled	30
Flake White	70
Tint White	8
Paris White	10

PALE SKY BLUE POSTER.

No. 1.

	lbs.
Royal Blue Poster No. 1	50
Flake White Poster No. 1	20

No. 2.

	lbs.
Royal Blue Poster No. 1	50
Flake White Poster No 1	20
Azure Blue	15

ROSE RED POSTER.

No. 1.

	lbs.
Middle Varnish	50
Paris White	32
Carminette	30
Vermilion	10

No. 2.

	lbs.
Middle Varnish	50
Paris White	40
Blue Varnish	5
Vermilion	10
Carminette	30

PERMANENT RED POSTER.

No. 1.

	lbs.
Middle Varnish	40
Geranium Lake A	20
Vermilion	8
Permanent Red	20
Paris White	20

FINE BLACK POSTER.

No. 1.

	lbs.
Pine Varnish	250
Vegetable Black	40
*Blue Solution	7
Carbon Black	3

* Blue Solution is made by grinding 1 lb. of Bronze Blue with 7 lbs. of Middle Boiled, and then mixing with 3 lbs. of Thin.

No. 2.

	lbs.
Pine Varnish	250
Vegetable Black	50
Paris White	14
Blue Solution	3

BROWN POSTER.

No. 1.

	lbs.
Middle Varnish	50
Paris White	30
Permanent Red	16
Ultra. Blue	3
Fine Jobbing Black	$1\frac{1}{4}$

No. 2.

	lbs.
Middle Varnish	50
Paris White	35
Permanent Red	16
Ultra. Blue	4
Fine Jobbing Black	$1\frac{1}{2}$

LEMON CHROME POSTER.

No. 1.

	lbs.
Middle Varnish	30
Lemon Chrome	30
Paris White	10

No. 2.

	lbs.
Middle Varnish	30
Lemon Chrome	25
Paris White	10

MIDDLE CHROME POSTER.

No. 1.

	lbs.
Middle Poster Varnish	50
Thin Poster	10
Lemon Chrome	30
Middle Chrome	20
Paris White	20

No. 2.

	lbs.
Middle Poster Varnish	52
Thin Poster	14
Lemon Chrome	25
Middle Chrome	20
Paris White	25

ORANGE POSTER.

No. 1.

	lbs.
Middle Poster Varnish	50
Strong Poster Varnish	5
Thin Poster Varnish	5
Orange Chrome	50
Paris White	30

No. 2.

	lbs.
Middle Poster Varnish	50
Thin Poster Varnish	10
Strong Poster Varnish	3
Paris White	35
Orange Chrome	45

CLARET POSTER.

No. 1.

	lbs.
Middle Poster Varnish	20
Strong Poster Varnish	4
Thin Poster Varnish	2½
Claret Lake	24
Ink Driers	2½

No. 2.

	lbs.
Middle Poster Varnish	22
Strong Poster Varnish	4
Thin Poster Varnish	3
Claret Lake	22
Ink Driers	2½
Paris White	5

No. 3.

	lbs.
Middle Poster Varnish	22
Strong Poster Varnish	7
Claret Lake	20
Ink Driers	2½
Tint White	2

GERANIUM POSTER.

No. 1.

	lbs.
Thin Poster Varnish	32
Middle Poster Varnish	2
Geranium Lake	48

No. 2.

	lbs.
Thin Poster Varnish	32
Strong Poster Varnish	4
Geranium Lake	40
Paris White	7

SCARLET LAKE POSTER.

No. 1.

	lbs.
Thin Poster Varnish	27
Middle Poster Varnish	3½
Scarlet Lake	40

No. 2.

	lbs.
Thin Poster Varnish	27
Middle Poster Varnish	4
Scarlet Lake	40
Tint White	5

POPPY RED POSTER.

No. 1.

	lbs.
Poster Scarlet Lake No. 1	50
Permanent Red Poster No. 1	50

No. 2.

	lbs.
Scarlet Lake Poster	50
Permanent Red	50
Strong Poster Ink	14
Tint White	2

LIGHT PINK POSTER.

No. 1.

	lbs.
Middle Poster Varnish	48
Flake White	164
Tint White	12
Permanent Red	3½

DEEP PINK POSTER.

No. 2.

	lbs.
Middle Poster Varnish	48
Flake White	140
Tint White	12
Permanent Red	7

LIGHT GREEN POSTER.

	lbs.
Lemon Chrome Poster, No. 1	50
Royal Blue Poster, No. 1	50
Bronze Blue Letterpress	3
Tinting Medium	3

DARK GREEN POSTER.

	lbs.
Lemon Chrome Poster, No. 1	50
Royal Blue Poster, No. 1	50
Bronze Blue	4
Tinting Medium	7

BRONZE GREEN POSTER.

	lbs.
Dark Green Poster	50
Middle Chrome Poster	10
Fine Black Poster	3

LAUREL GREEN POSTER.

	lbs.
Dark Green Poster	50
Bronze Blue Letterpress	1½
Fine Black Poster	3

LIGHT OLIVE GREEN POSTER.

	lbs.
Bronze Green Poster	50
Light Green Poster	25
Middle Chrome	5

DEEP OLIVE GREEN POSTER.

	lbs.
Bronze Green Poster	50
Laurel Green	25
Middle Chrome	1

RED POSTER.

	cwt.	qrs.	lbs.
Vermilion	1	0	0
Orange Lead	0	1	0
Thick Litho.	0	1	8
Thin Litho.	0	0	21

DARK RED POSTER.

	cwt.	qrs.	lbs.
Deep Vermilion	1	0	0
Paris White	0	0	14
Thick Litho.	0	1	0
Thin Litho.	0	0	18

LIGHT GREEN POSTER.

	cwt.	qrs.	lbs.
*Emeraldine	1	0	0
Paris White	0	0	14
Thick Litho.	0	1	3
Thin Litho.	0	0	14

*Or a suitable emerald tint pigment.

DARK GREEN.

	cwt.	qrs.	lbs.
Emeraldine	0	3	19
Prussian Blue	0	0	9
Thick Litho.	0	1	12
Thin Litho.	0	0	17

PALE YELLOW.

	cwt.	qrs.	lbs.
Genuine Lemon Chrome	1	0	0
Paris White	0	0	14
Thick Litho.	0	1	23
Thin Litho.	0	0	24

DEEP YELLOW.

	cwt.	qrs.	lbs.
Genuine Deep Chrome	1	0	0
Paris White	0	0	14
Thick Litho.	0	1	20
Thin Litho.	0	0	22

ORANGE GOLD.

	cwt.	qrs.	lbs.
Genuine Orange Chrome	1	0	0
Paris White	0	0	14
Thick Litho.	0	1	2
Thin Litho.	0	0	21

BLACK.

	cwt.	qrs.	lbs.
Mineral Black	0	2	0
Thick Litho.	0	2	1
Thin Litho.	0	1	5

IVORY WHITE.

	cwt.	qrs.	lbs.
Zinc, Green Seal	0	2	0
Genuine Lead	0	2	0
Thin Litho.	0	2	0
Thick Litho.	0	0	8
Lemon Chrome	0	0	1

DARK STONE.

To above add—

Best Grinding Ochre .... 7 lbs.

DRAB.

To above add—

Best English Umber .... 3 lbs.

Best Grinding Ochre .... 3¼ lbs.

News Inks.

BLACK.

No. 1.

	cwt.	qrs.	lbs.
Mineral Black	1	0	0
Thin Varnish Litho.	0	3	4
Wax	0	0	11
Paraffin	0	0	5
Pale Rosin	0	0	5

No. 2.

	cwt.	qrs.	lbs.
Mineral Black	1	0	0
Vegetable Black	0	2	14
Paris White	0	0	14
Thick Litho.	0	2	17
Thin Litho.	0	0	16
Paraffin Wax	0	0	12
Pale Rosin	0	0	6

No. 3.

To preceding add extra—

Paris White	14	lbs.
Thick Litho.	3	lbs.

ARAB BROWN.

	cwt.	qrs.	lbs.
Best English Umber	0	1	14
York Brown	1	0	10
Thick Litho. Varnish	0	3	1
Thin Litho.	0	0	10

VERDITER.

	cwt.	qrs.	lbs.
Emerald Green	0	3	0
Lemon Chrome	0	0	8
Green Verditer	0	0	16
Thick Litho.	0	2	7
Thin Litho.	0	1	18
Wax	0	0	7

PALE GOLD.

	cwt.	qrs.	lbs.
Raw Sienna	0	2	20
Lemon Chrome	0	0	15
Thin Litho.	0	2	12

ROSE RED.

No. 1.

	lbs.
Thin Litho.	68
Rose Red	84

No. 2.

	lbs.
Thin Litho.	68
Rose Red	50
Imitation Vermilion	50

COMMON GERANIUM.

	lbs.
Thin Litho.	48
Common Geranium	36
Imitation Carmine	36
Middle Litho.	46

LABEL RED.

	lbs.
Burnt Weak Oil	28
Burnt Strong Oil	74
English Vermilion	120
Imitation Vermilion	26

RED.

No. 1.

	lbs.
Burnt Strong Oil	35
Burnt Weak Oil	25
English Vermilion	16
Orange Lead	56
Soft Soap	5

No. 2.

	lbs.
English Vermilion	45
Orange Lead	85
Burnt Weak Oil	51
Burnt Strong Oil	27
Soap	5

Letterpress Inks.

TRANSPARENT TINTING INK.

	lbs.
New Thin	10
Tint White	10
Zinc Oxide	1
Pale Gold Size	2
Strong Burnt	1

PALE BRONZING PREPARATION.

	lbs.
Middle Boiled	30
Strong Burnt	4
Acetate of Lead	7
Tint White	$7\frac{1}{2}$

DARK BRONZING PREPARATION.

	lbs.
Middle Boiled	30
Strong Burnt	10
Burnt Umber	38
Gold Size	4
Borate of Manganese	$6\frac{1}{4}$
Burnt Sienna	3

BRONZE RED LETTERPRESS.

	lbs.
Middle Boiled	8
New Thin	$\frac{1}{4}$
Bronze Red	9
Tint White	3

BRONZED BEETLE LETTERPRESS.

	lbs.
Bronze Red Letterpress	23

Super. Bronze Blue, 1 oz. per lb.

BRONZE BLUE LETTERPRESS.

	lbs.
Thin Burnt	22
Special Bronze	25
Soft Soap	7 ozs.

BRONZE BLUE LETTERPRESS.
No. 2.

	lbs.
Tint Oil	18
Middle Boiled	1
Special Bronze	22

SPECIAL BRONZE BLUE LETTERPRESS A.

	lbs.
Tint Oil	40
Middle Boiled	2½
Special Bronze Blue	66
Soft Soap	1½

SPECIAL BRONZE B.

	lbs.
Thin Burnt	40
Special Bronze	50
Soft Soap	1

SPECIAL BRONZE C.

	lbs.
Tint Oil	38
Middle Oil	4½
Special Bronze	58

SPECIAL BLUE D.

	lbs.
Thin Burnt	$40\frac{1}{2}$
Special Bronze	$48\frac{1}{2}$
Soft Soap	$1\frac{1}{4}$

All the preceding Bronze Blues must be mixed and run through rollers as quickly as possible; otherwise, the colour will fatten up and be quite useless, and impossible to grind. The soft soap should be put in when finishing through rollers the last time.

LEMON CHROME LETTERPRESS A.

	lbs.
Middle Boiled	40
New Thin	20
Lemon Solid	95

LEMON CHROME LETTERPRESS B.

	lbs.
Middle Varnish	45
Strong Burnt	4
Lemon Solid	98
Tint White	$\frac{1}{2}$

MIDDLE CHROME LETTERPRESS A.

	lbs.
Middle Boiled	55
Strong Burnt	12
Middle Solid	95

MIDDLE CHROME LETTERPRESS B.

	lbs.
Middle Varnish	30
New Thin	30
Middle Solid	50
Lemon Solid	58

MIDDLE GREEN LETTERPRESS.

	lbs.
Lemon Chrome Letterpress A	30
Bronze Blue A	1½

DEEP GREEN LETTERPRESS.

	lbs.
Lemon Chrome Letterpress	30
Bronze Blue B	3½

NAVY BLUE LETTERPRESS A.

	lbs.
Ultramarine Blue Ink	27½
Bronze Blue A Ink	20
Geranium A Ink	4

NAVY BLUE LETTERPRESS B.

	lbs.
Ultra. Blue A Ink	29
Bronze Blue A Ink	23

MIDDLE GREEN LETTERPRESS A.

	lbs.
Lemon Chrome A	20
Bronze Blue A	1½

MIDDLE GREEN LETTERPRESS B.

	lbs.
Lemon Chrome A	22
Bronze Blue A	2

LIGHT GREEN LETTERPRESS A.

	lbs.
Lemon Chrome A Ink	20
Bronze Blue A Ink	¾

LIGHT GREEN LETTERPRESS B.

	lbs.
Lemon Chrome A Ink	22
Bronze Blue Ink	¾

AZURE BLUE FOR SOAP WRAPPERS.

	lbs.
Ultramarine Blue A	32
Flake White	22
A Black ⅛ oz.	

FLAKE WHITE LETTERPRESS.

	lbs.
Middle Boiled	48
Flake White	160
Tint White	15

OLIVE GREEN LETTERPRESS.

	lbs.
Light Green A Letterpress Ink	30
A Black	½
Middle Chrome A	4

LAUREL GREEN LETTERPRESS.

	lbs.
Light Green B	30
A Black	½
Middle Chrome A	4½
Bronze Blue A	¾

ULTRA. BLUE LETTERPRESS A.

	lbs.
Blue Varnish	30
Middle Boiled	8
Ultra. Blue No. 1	37

ULTRA. BLUE LETTERPRESS B.

	lbs.
Blue Varnish	30
Middle Boiled	$8\frac{1}{2}$
Ultra. Blue No. 1	32

VERMILION LETTERPRESS.

	lbs.
Middle Boiled	60
Tint White	10
Paris White	14
Vermilion, Best	94

CARMINE LETTERPRESS.

	lbs.
Geranium Letterpress Ink	20
Vermilion Letterpress Ink	10
Claret Letterpress Ink	3

DEEP SHADE PERMANENT RED.

	lbs.
Permanent Red No. 1	30
Tint White	2
Middle Boiled	20

CLARET LETTERPRESS.

	lbs.
Middle Boiled	40
Strong Burnt	6
Claret Lake	50
Tint White	12

CARNATION LETTERPRESS.

	lbs.
Vermilion Letterpress Ink	50
Geranium Letterpress Ink	20

GERANIUM LETTERPRESS.

	lbs.
New Thin	70
Strong Burnt	3½
Geranium Lake No. 1	100

STRONG BROWN LETTERPRESS A.

	lbs.
Middle Varnish	30
New Thin	10
Strong Burnt	7
Italian Ochre	74
Raw Sienna	4

STRONG BROWN LETTERPRESS B.

	lbs.
Middle Varnish	30
Thin	10
Strong Burnt	6
Raw Umber	5
Italian Ochre	78

AGATE LETTERPRESS A.

	lbs.
Thin Burnt	32
Middle boiled	32
Strong Burnt	15
Agate	97

AGATE LETTERPRESS B.

	lbs.
Thin Burnt	34
Middle Boiled	32
Tint White	7
Strong Burnt	14
Agate	100

BLACK FINE JOBBING.

	lbs.
Middle Boiled	98
Thin	12
Carbon Black	45
Blue Solution	25

WOOD CUT.

	lbs.
Middle Varnish	100
Thin	13
Carbon Black	44½
Gas Black	7
Blue Solution	26

ORDINARY JOBBING BLACK LETTERPRESS A.

	lbs.
Pine Varnish	100
Middle Boiled	90
Vegetable Black	35
Carbon Black	50
Blue Solution	33

ORDINARY JOBBING B.

	lbs.
Pine Varnish	150
Middle Boiled	55
Vegetable Black	40
Carbon Black	45
Blue Solution	30

BURNT UMBER LETTERPRESS A.

	lbs.
Thin	40
Thin Burnt	25
Umber Burnt	45

BURNT UMBER B.

	lbs.
Thin	40
Thin Burnt	20
Burnt Umber	40
Bismarck Brown	1

DEEP BLUE BLACK (HALF-TONE).

	lbs.
Ultra. Blue Letterpress A	40
Wood Cut Black	20
Fine Jobbing	20

LIGHT BLUE BLACK (HALF-TONE).

	lbs.
Ultra. Blue A	40
Bronze Blue	6
Wood Cut Black	5
Fine Jobbing	$2\frac{1}{2}$

VIOLET BLACK LETTERPRESS.

	lbs.
Ultra. Blue Letterpress A	40
Purple Letterpress Ink	100
Fine Jobbing	40

DEEP VIOLET BLACK LETTERPRESS.

	lbs.
Ultra. Blue Letterpress A	40
Vermilion A	40
Geranium A	10
Fine Jobbing	20

BRONZE CLARET.

No. 1.

		lbs.
Middle Boiled		$7\frac{1}{2}$
Bronze Red		$7\frac{3}{4}$
Tint White		3
Bronze Blue	$\frac{1}{4}$ oz.	

RICH.

No. 2.

		lbs.
Middle Boiled		9
Bronze Red		10
Tint White		2
Bronze Blue	$\frac{1}{4}$ oz.	
No. 16 Pale Carmine	$\frac{1}{4}$ oz.	

BRONZE CHERRY.

	lbs.
Bronze Red	23

$\frac{1}{2}$ oz. bronze blue to lb. of above.

FINE BLACK LETTERPRESS INK FOR HALF-TONE WORK.

	lbs.
Middle Varnish	110
New Thin	$10\frac{1}{2}$
Peerless Black	43
Carbon Black	$5\frac{1}{2}$
Blue Solution	28

SUPER. BLACK LETTERPRESS.

	lbs.
Middle Boiled	102
New Thin	12
Peerless Black	44
Carbon Black	6
Blue Solution	26

BLACK LETTERPRESS.
No. 3.

	lbs.
Pine Varnish	100
Middle Boiled	100
Vegetable Black	40
Carbon Black	50
Blue Solution	37

LEMON CHROME SOLID LETTERPRESS.

	lbs.
Middle	35
New Thin	17
Lemon Chrome	86½
Tint White	2

MIDDLE SOLID LETTERPRESS.

	lbs.
Middle	48
Strong Burnt	10½
Lemon Chrome	50
Middle Chrome	39

FINE MIDDLE SOLID LETTERPRESS.

	lbs.
Middle Varnish	28
New Thin	28
Lemon Chrome	58
Middle Chrome	58

Blacks.

JOBBING NEWS INK.

No. 1.

	lbs.
Pine Varnish	490
Vegetable Black	92
Blue Solution	2

No. 2.

	lbs.
Pine Varnish	510
Vegetable Black	90
Blue Solution	4

SUPER. NEWS INK.

	lbs.
* Rosin Compo	512
Vegetable Black	114
Carbon Black	4
Blue Solution	4½

* Rosin compo. is 28 lbs. more of dark rosin added to pine varnish.

Litho. Inks.

The following is a very complete list of litho. inks, which are the finest quality of printing inks that are made. Both the varnish and the pigment must be selected with care, and the grinding skilfully carried out.

BRONZE BLUE LITHO. INK.

Grind through steel rollers as quickly as possible, with the varnish made as follows :—

Tint Oil	15	parts
Strong Burnt	1	part
Middle Boiled	1	part
Bronze Blue	17	parts

In grinding bronze blue for litho. works, the principal thing is to get the desired bloom on the ink before the rollers get hot as, if the rollers are allowed to run hot, the bronze is ruined. Get the blue through the rollers as quickly as possible, and never attempt more than a 28 lbs. batch at once, otherwise it will be ruined. The blue is generally run through slack on one pair of rollers, then finished on the next pair, so as to ensure coolness.

For letterpress, add about 3 ozs. of soft soap to the batch of 28 lbs., which enables the roller to be washed easily.

FINE BRONZE BLUE LITHO. INK.

	lbs.
Tint Oil	3½
Middle	2
Strong	¼
No. 1 Bronze Blue	12

SUPER. BRONZE BLUE LITHO.

	lbs.
Tint Oil	16
Middle Boiled	2
Special Bronze Blue	18

BRONZE BLUE A.

	lbs.
Tint Oil	12
Middle Boiled	10½
Deep Bronze Bluc	42

BRONZE BLUE B.

	lbs.
Tint Oil	35
Strong Burnt	3
Special Bronze	50

BRONZE BLUE C.

	lbs.
Thin Burnt	24
Tint Oil	36
Strong Burnt	$2\frac{1}{2}$
Special Bronze	60
Middle Varnish	8

FINEST BRONZE BLUE D.

	lbs.
Tint Oil	30
Middle Varnish	10
Bronze Blue Special	66

REDS.

VERMILION A.

	lbs.
Middle Boiled Varnish	25
Paris White	$12\frac{1}{2}$
Vermilion, Genuine	36

VERMILION LITHO. B.

	lbs.
Middle Boiled	26
Strong Burnt	1
Paris White	13
Tint White	2
Vermilion, Genuine	$36\frac{1}{2}$

RICH VERMILION LITHO.

	lbs.
Middle Boiled	22
New Thin	2
Paris White	$11\frac{1}{2}$
Pale Vermilion	37
Geranium Lake 7 ozs.	

FINE VERMILION LITHO.

	lbs.
New Thin	20
Middle Boiled	3
Tint White (Hydrate of Alumina)	4
Vermilion	40
Geranium Lake ...... 3 ozs.	

PALE PINK LITHO.

	lbs.
Middle Boiled	22
Flake White	85
Tint White	$6\frac{1}{2}$
Fine Vermilion Ink	10

LIGHT PERMANENT RED LITHO.

	lbs.
Light Permanent Orange	38
Tint White	$6\frac{3}{4}$
Middle Boiled	12
Strong Burnt	2
New Thin	$1\frac{3}{4}$

FAST DEEP PERMANENT RED LITHO.

	lbs.
Deep Permanent Red	35
Tint White	7
Middle Varnish	13
Strong Burnt	2
New Thin	2

SPECIAL RED LITHO.

	lbs.
Middle Boiled	11
Strong Burnt	$1\frac{1}{4}$
Fine Carmine	10
Paris White	13
Light Permanent Red	14

SUPER. LEMON SOLID CHROME LITHO.

	lbs.
Middle Varnish	40
Strong Burnt	8
Lemon Chrome	95½
Tint White	½
Lard	¼

FINE LEMON CHROME LITHO.

	lbs.
Middle Boiled	43½
Strong Burnt	5
Lemon Chrome	95
Tint White	3
Lard	¼

MIDDLE SOLID CHROME LITHO.

	lbs.
Middle Boiled	24
Strong Burnt	10
Middle Chrome	48
Lemon Chrome	60½
Tint White	8

SCARLET LITHO. A.

	lbs.
Thin	30
Middle	10
Tint White	30
Scarlet Lake	100

LIGHT SCARLET FAST RED LITHO.

	lbs.
Scarlet Fast Red	34
Tint White	6¼
Middle Boiled	12
Strong Burnt	2½
Thin Oil	3

DEEP SHADE FAST RED LITHO. A.

	lbs.
Deep Scarlet Fast Red	36
Tint White	7
Middle Varnish	12½
Strong Burnt	2½
Thin	2

DEEP SHADE FAST RED LITHO. B.

	lbs.
Deep Scarlet Fast Red Litho.	36
Tint White	8
Middle Varnish	13
Paris White	4
Thin	3

BRILLIANT RED LITHO. A.

	lbs.
Middle Varnish	13
Scarlet Lake	24
Orange Lead	4
Paris White	10
Thin	3

BRILLIANT RED LITHO. B.

	lbs.
Middle Varnish	12½
Scarlet Lake	20
Paris White	14
Thin	3
Tint White	5

BROWN LITHO. A.

	lbs.
Middle Varnish	24
Strong Burnt	24
Light Purple	66
Bismarck Brown	1
Bronze Blue ½ oz. to 1 lb.	

BROWN LITHO. B.

	lbs.
Middle Varnish	20
Strong Burnt	23
Light Purple	60
Paris White	7
Bronze Blue	½ oz. to 1 lb.
Black	¼ oz. to 1 lb.

CHOCOLATE BROWN LITHO. A.

	lbs.
Permanent Red Light	20
Ultra. Blue 1	2
Black	¼ oz.

CHOCOLATE BROWN LITHO. B.

	lbs.
Permanent Red	20
Ultra. Blue	6
Black	½ oz.

PHOTO. BROWN (FULL-TONE).

	ozs.
Ultra. Blue No. 1 (Ink)	15
Vermilion B Ink	50
Black B	50

CHOCOLATE PHOTO. BROWN.

	lbs.
Light Purple	10
Scarlet Lake A	50
Black B.	50

BLACK LITHO. B.

	lbs.
Strong Burnt	65
Middle Boiled	25
Carbon Black	55
Blue Varnish	15

BLACK LITHO. C.

	lbs.
Carbon Black	28
Tint White	5
Paris White	5
Middle Boiled }	sufficient
Strong Burnt }	sufficient

BLACK LITHO. D.

	lbs.
Carbon Black	22
Paris White	7
Middle Boiled }	sufficient
Strong }	sufficient

BLACK LITHO. E.

	lbs.
Carbon Black	20
Paris White	10
Middle Boiled	sufficient

BURNT UMBER LITHO. A.

	lbs.
Middle Boiled	12
Strong Burnt	4
Burnt Umber	27

BURNT UMBER B.

	lbs.
Middle Boiled	12
Strong Burnt	3
Burnt Umber	28

LEMON CHROME A.

	lbs.
Middle Varnish	45
Strong Burnt	6
Lemon Chrome Solid	95

LEMON CHROME B.

	lbs.
Middle Varnish	45
Strong Burnt	6
Tint White	5
Lemon Solid	100
Middle Chrome	

MIDDLE CHROME LITHO. A.

	lbs.
Middle Varnish	24
Strong Burnt	14
Middle Solid	44
Lemon Solid	60

MIDDLE CHROME LITHO. B.

	lbs.
Middle Varnish	26
Strong Burnt	14
Middle Solid	40
Lemon Solid	55
Paris White	10
Lard	½

NAVY BLUE LITHO. A.

	lbs.
Ultra. Blue Ink	28
Bronze Blue Ink	25
Geranium Lake Ink	12

NAVY BLUE LITHO. B.

	lbs.
Ultra. Blue Ink	28
Bronze Blue Ink	20
Geranium Lake Ink	10

SKY BLUE LITHO. A.

	lbs.
Flake White	16
Tinting Medium	17
Bronze Blue B.	½

SKY BLUE LITHO. B.
TO STAMP SOAP WRAPPERS.

	lbs.
Ultra. Blue No. 1	45
Flake White	30
Black B	¼ oz.

ULTRA. BLUE NO. 1 LITHO. A.

	lbs.
Strong Burnt	20
Middle Boiled	5
Ultra. Blue, Best	21
Paris White	5

ULTRA. BLUE LITHO. B.

	lbs.
Strong Burnt	18
Middle Boiled	6
Best Ultra. Blue	22
Paris White	7

GERANIUM LAKE A.

	lbs.
Thin	32¼
Strong	1¾
Midd..t Geranium Lake	37
Strong..m Geranium Lake	15
Lemon C	

GERANIUM LAKE B.

	lbs.
Thin	32
Strong	$1\frac{3}{4}$
Best Geranium	39
Medium Geranium	17

BRONZE CLARET LITHO. A.

		lbs.
Middle Boiled		30
Thin		1
Bronze Red		32
Tint White		9
Bronze Blue	1 oz.	

BRONZE CLARET B.

		lbs.
Middle Boiled		33
Bronze Red		30
Tint White		7
Bronze Blue	$\frac{3}{4}$ oz.	

RUBY LITHO. A.

	lbs.
Middle Varnish	27
Paris White	18
Carminette	18
Vermilion	7

RUBY LITHO. B.

	lbs.
Middle Varnish	25
Strong Burnt	$1\frac{1}{4}$
Carminette	18
Vermilion	7
Paris White	16

LIGHT GREEN LITHO.

	lbs.
Lemon Chrome Litho. A	30
Bronze Blue Litho. A	1

DARK GREEN LITHO.

	lbs.
Lemon Chrome Litho. A	30
Bronze Blue A	2

THE FOLLOWING ARE FOR HALF-TONE WORK.

BLACK LITHO.

	lbs.
Strong Burnt	70
Middle	23½
Carbon Black	23
Peerless Black	34¼
Blue Solution	17

FULL-TONE BLACK LITHO.

	lbs.
Strong Burnt	73
Middle Boiled	32
Peerless Black	63
Blue Solution	22

BLENDS FOR THREE COLOUR PRINTING.

FULL-TONE AND PHOTO. BLACKS.

PHOTO. GREEN.

	lbs.
Green	28
Deep Blue	8
S. Black	8¼

PHOTO. GREEN BLACK.

	lbs.
Green	28
Deep Blue	8
S. Black	38

VIOLET PHOTO. BLACK.

	lbs.
Deep Blue	8½
Purple	28
Light Blue	8

PHOTO BROWN.

	lbs.
Blue	8½
Vermilion	48
Black	48½

DEEP PHOTO. BLUE, VIOLET SHADE.

	lbs.
Deep Blue	18
Rose Lake	18
S. Black	8

BRILLIANT PHOTO. BLUE.

	lbs.
Blue	30
Purple	9½
Deep Blue	9½

TWO COLOUR BLENDS.

DEEP BLUE BLACK.

	lbs.
Deep Blue	18
S. Black	8½

LIGHT BLUE BLACK.

	lbs.
Deep Blue	52
S. Black	6½

Printing Ink Varnishes.

The following varnishes are typical, and are referred to in the foregoing recipes.

POSTER PINE VARNISH (FOR BLACKS).

	cwt.	qrs.	lbs.
Common Brown Rosin	6	0	0
Vegetable Oil (Rosin Oil	0	3	7
Rosin Spirit	1	0	16

Process.—Place rosin in pot, and bring up heat to 300 F. for twenty minutes. Now add vegetable oil gradually. Continue boiling for another fifteen minutes, then take from fire to cool outside factory. Allow to cool down to about 80 F., then stir well in the resin spirit.

POSTER VARNISH FOR COLOURED POSTER INKS.

MIDDLE (COMMON).

	cwt.	qrs.	lbs.
Refined Oil .... 20 gallons			
Medium Rosin	0	0	14
White Windsor Soap	0	0	0½
Lard	0	0	0½

Process.- Place pot on fire with the oil ; raise heat up gently to 300° F. first, and then gradually raising to 550° F., then add gently, a little at a time, the rosin previously powdered. Now add soap gently, then keep heat up for a whole day. Next day heat up again to 550°, and keep up for eight hours, afterwards cooling and tanking for use. After passing through 100 mesh wire, add lard at finish while the batch is still warm.

THIN POSTER VARNISH.

		cwt.	qrs.	lbs.
Refined Linseed Oil	20 gallons			
Refined Cottonseed Oil ..	5 gallons			
Medium Rosin		0	1	0
White Soap		0	0	1

Process.—Same as for middle, but boiled at 550° F. for 10 hours only.

STRONG POSTER VARNISH (COMMON).

		cwt.	qrs.	lbs.
Refined Linseed	20 gallons			
Medium Rosin		0	2	20
White Windsor Soap		0	0	4
Common Lard		0	0	0½

Keep up to 550° for 24 hours.

STRONG POSTER VARNISH (FINE).

		cwt.	qrs.	lbs.
Raw Linseed	4 gallons			
Cottonseed Oil	2 gallons			
Fine Pale Rosin		0	2	20
Mutton Tallow		0	0	20
Turps.	1 gallon			

Process.—Boil up for two hours the linseed and cotton oil, then add tallow. Keep heat up to 400° F. for 30 minutes more, then have rosin run in sling pot, and gradually add the oil to same. When all is in, stir well, and keep heat up for another 20 minutes. Cool down and add turps. Pass through 100-mesh strainer whilst still warm.

CHAPTER III.

TEREBINES AND GOLD SIZES.

Terebines.

Terebines, or liquid driers, are in considerable request, and are made to suit varying requirements. They are of two main kinds: (1) Those which contain no gum, (2) those which contain gum. Under (1) might be included the varnish drier mixtures described in Chapter I., and we now give in detail a complete series of terebines made without gum.

It may be noted in passing that these varnish products are entirely different to the substance known as *terebene*, which is a definite organic body formed by the action of sulphuric acid on turpentine.

No. 1.

Linseed Oil	40	gallons
Red Lead	20	lbs.
Litharge	20	lbs.
Black Oxide of Manganese	20	lbs.

Heat the oil to 500° F., add the driers, and keep on heat till all is dissolved, then cool to 240° F., and thin with turps. to required consistency.

No. 2.

Linseed Oil	40	gallons
Red Lead	20	lbs.
Litharge	20	lbs.
Oxide or Sulphate of Manganese	20	lbs.
White Sugar of Lead	5	lbs.

Turps. to consistency.

Have all the driers as pure as possible, and well dried on trays and mixed together. Heat the oil to 550° F. and sprinkle in the driers (or commence to add the driers at 350° F.); keep on the heat at 550° F. until all the driers are dissolved and taken up by the oil, which can be ascertained by testing the oil, which must be clear and stringy, and with little or no sediment at the bottom; then cool to 250° F. and commence adding the turps., very gradually, and well stirring for the first few gallons so as not to chill the oil, then the remainder can be added more briskly. Now let it settle—the longer the better—and the terebine will be bright in three to four days, and star bright in about three weeks.

DARK TEREBINE LIQUID DRIER.

Put in running pot 12 gallons of Baltic oil, and raise temperature to 250° F. Introduce slowly on slow fire 60 lbs. of litharge, 30 lbs. of red lead. Raise the temperature to 520° F., keep at this heat one hour. If, on cooling, the substances break hard and crisp, it is baked sufficient. Take pot from fire. Thin out with 40 gallons of turps.

PALE TEREBINES.

These are often sold as specialties.

No. 1.

Linseed Oil	40	gallons
Borate of Manganese	14	lbs.
Sulphate of Manganese	14	lbs.
White Sugar of Lead	28	lbs.
Turps., or more if required, according to consistency	50	gallons

No. 2.

Linseed Oil	40	gallons
Litharge	28	lbs.
Sulphate of Manganese	14	lbs.
Sulphate of Zinc	14	lbs.
Turps.	60	gallons

No. 3.

Linseed Oil	40	gallons
Sulphate of Zinc	56	lbs.
Sulphate of Manganese	56	lbs.
Acetate of Lead	28	lbs.
Borate of Manganese	28	lbs.

Turps. to consistency.

POWERFUL DRIER.

No. 4.

Linseed Oil	40	gallons
Borate of Manganese	33	lbs.
Acetate of Lead	33	lbs.
Sulphate of Manganese	33	lbs.
Litharge	33	lbs.

Turps. to consistency.

VERY POWERFUL DRIER.

No. 5.

Linseed Oil	40	gallons
Acetate of Lime	33	lbs.
Sulphate of Manganese	66	lbs.
Litharge	100	lbs.

Turps. to consistency.

STOUT TEREBINES.

No. 1.

Linseed Oil	40	gallons
Litharge	1½	cwts.
Turps.	100	gallons

Boil the oil at 550° F. for five or six hours, stirring in the litharge until all is dissolved. Draw the fire, cool down to 220° F., and add the turps.

No. 2.

Baltic Linseed Oil	40	gallons
Litharge	1½	cwts.
Manganese Dioxide	20	lbs.
Turps.	100	gallons

No. 3.

Baltic Linseed Oil	40	gallons
Litharge	1½	cwts.
Sulphate of Manganese	20	lbs.
Turps.	100	gallons

No. 4.

Linseed Oil	40	gallons
Powdered Litharge	2	cwts.
Raw Turkey Umber	2	cwts.
Turps.	120	gallons

The foots or bottoms deposited in making terebine, when ground into paint by adding oil, dries hard and makes a hard paint, suitable for ships' bottoms, etc.

Terebines to Suit Different Climates.

FOR COLD CLIMATES.

White Sugar of Lead	56	lbs.
White Copperas	70	lbs.
Litharge	40	lbs.
Sulphate of Manganese	24	lbs.
Oil	40	gallons

Thin with turps. to consistency.

FOR TEMPERATE CLIMATES.

White Copperas	65	lbs.
White Sugar of Lead	50	lbs.
Litharge	40	lbs.
Sulphate of Manganese	20	lbs.
Oil	40	gallons

Thin with turps. to consistency.

FOR HOT CLIMATES.

White Sugar of Lead	35	lbs.
White Copperas	50	lbs.
Litharge	28	lbs.
Sulphate of Manganese	10	lbs.
Oil	40	gallons

Thin with turps. to consistency.

Terebines containing Gum.

BEST TEREBINE DRIERS.

Refined Linseed Oil C	40	gallons
Pale Kauri	60	lbs.
Dried Litharge	56	lbs.
Red Lead	28	lbs.
Dried White Copperas	14	lbs.

Process.—Made in a 300-gallon furnace (copper or enamelled iron); heat up all the oil in the furnace to 350°—380° F., then run two 30-lb. or three 20-lb. pots of gum kauri and oil, each one with 2 gallons of the hot oil out of the furnace; when cooled a little, add them to the bulk of the oil in the furnace, and stir well together. The lead, litharge, and copperas are now added, and the whole boiled at 420°—450° F. for the rest of the day, and well stirred down. The next day the boiling must be continued at 450°—480° F., with plenty of stirring. Thin the next morning at 300° F. with 200 gallons of American turps. Strain, and tank one month before sending out.

2ND QUALITY.

Refined Linseed Oil C	40	gallons
Gum Kauri Chips	28	lbs.
Dried Red Lead	21	lbs.
Dried Litharge	30	lbs.
American Turps.	200	gallons

Made in the same way as best, and should also be kept in stock one month before sending out.

No. 3.

Linseed Oil	40	gallons
Gum Kauri	2	cwts.
Burnt Turkey Umber	28	lbs.
Lime	12	lbs.
Turps.	72	gallons

No. 4.

Baltic Oil (Boiled)	27	gallons
Raw Linseed Oil	13	gallons
Red Lead	18	lbs.
Sulphate of Iron	9	lbs.
Gum Animi	56	lbs.
Turps.	80	gallons

No. 5.

Baltic Oil (Boiled)	10	gallons
Gum Kauri	90	lbs.
*Terebine	30	gallons
Turps.	15	gallons

Run the gum and add the hot oil. Cool down to 250° F., stir in the terebine and add the turps.

*This may be one of the oil terebines already described

No. 6.

Baltic Oil	10	gallons
Gum Kauri	1	cwt.
Terebine	30	gallons
Turps.	15	gallons

Process as above.

FINEST TEREBINE.

	cwt.	qrs.	lbs.
Medium Kauri	0	3	7
Lin. Oil (Double Boiled), 16 gallons			
Flake Litharge	0	2	0
Black Oxide of Manganese	0	0	7
American Turps. .... 100 gallons			

TEREBINE.

No. 2.

	cwt.	qrs.	lbs.
Medium Rosin	1	0	0
Medium Kauri	0	0	14
Linseed Oil .... 16 gallons			
Litharge	0	1	0
Black Oxide of Manganese	0	0	14
Turps. .... 100 gallons			

NOTE.—For pale terebine use in the above pale kauri and white copperas in place of oxide of manganese.

BEST PALE TEREBINE LIQUID DRIER.

Melt–	Manilla Chips	26	lbs.
	Dammar Dust	26	lbs.
Add–	Hot Linseed Oil	8	gallons

Raise the temperature to 380° F. Introduce slowly 20 lbs. of litharge, 4 lbs. sugar of lead, and 1 lb. of borate of manganese. Raise the temperature to 520° F.; keep at this heat for one hour. If, on cooling, the substances break hard and crisp, it is baked sufficiently. Take pot from fire, and thin out immediately with 30 gallons of turps.

PALEST TEREBINE OR LIQUID DRIERS.

Palest Brazilian Copal	168	lbs.
Refined Linseed Oil C	40	gallons
American Turps.	120	gallons

Run the gum, add the oil, and thin with the turps.

SPECIAL TEREBINE.

Dark Boiled Oil	40	gallons
No. 1 Kauri Gum	200	lbs.
Sugar of Lead	60	lbs.
Flake Litharge	30	lbs.
Red Lead	30	lbs.
Red Oxide of Iron	5	lbs.
Turkey Umber	2½	lbs.
Sulphate of Manganese	5	lbs.
Sulphate of Zinc	5	lbs.
Turps.	150	gallons

PALE TEREBINE (COLD METHOD).

	parts.
Sierra Leone Copal Gold Size	1
Turps.	1

No. 2.

	parts.
Kauri Gold Size	1
Turps.	1

No. 3.

	parts.
Manilla Gold Size	1
Turps.	1

TEREBINE.

	cwt.	qrs.	lbs.
Resin, Pale	0	2	[illegible]
Gum Kauri	0	1	0
Boiled Oil	0	1	0
Lead Acetate	0	0	10
Red Lead	0	0	7
Manganese Sulphate	0	0	7
Turps. 20 gallons			

Run the gum kauri and resin together, heat boiled oil, and add it to the melted gum. Stir, and heat up from 350° F. to 400° F., and gradually add the red lead, acetate lead, and manganese sulphate. Keep the heat up for an hour, allow the temperature to cool to 250° F., then add the turps. very slowly.

TEREBINE.

Kauri 2nd	30	lbs.
Oil	4	gallons
Litharge	4	lbs.
Black Manganese	1	lb.
Turps.	14	gallons

Melt 30 lbs. 2nd Kauri, add 4 gallons oil, put driers in, and give a good cooking until it is hard, then thin with turps. at 200°.

TEREBINE.

Put 18 gallons of oil in pot with 1½ cwt. of dark rosin; when melted, put 1½ cwt. litharge and 14 lbs. black manganese. Boil slowly, and keep well stirred until it assumes a dark brown colour, then thin with 80 gallons of turps.

Gold Size.

Under the above general term are included several varieties of varnish-like substances possessing powerful drying and binding properties. The two chief classes are Japanners' gold size and Gilders' gold size, the latter being used to attach gold-leaf to the surface which is being gilded. Gold size is also used by painters to cause varnish to dry quicker, and as a binder in flatted paint.

In the best sorts of gold size, a fine gum, such as animi, is used, while cheaper grades are used in the commoner qualities. There is considerable variation in the driers used in boiling the oil, as will be seen from the following recipes.

JAPAN GOLD SIZE.

Linseed Oil	40	gallons
Litharge	28	lbs.
Red Lead	28	lbs.
White Copperas	12	lbs.

Measure the oil into an enamelled iron copper. Light the fire, and, at 350° F., commence adding the driers, either in the dry state or previously ground together with a few gallons linseed oil. Increase the heat to 450°—500° F. and boil until all is dissolved.

Meanwhile run 40 lbs. gum animi (in several runnings if necessary), thin with a few gallons hot oil, and pour into the boiling copper, stirring and mixing well together. Increase the heat and keep it at about 500°—550° F. The frothy head must be well beaten down. In about five hours the contents of the copper will be found stringy when tried upon glass. If it feels sticky and strings strongly it is boiled enough. Cool down as quickly as possible and add 100 gallons turps., stirring together after all is in.

This gold size dries in 15 to 20 minutes.

No. 2.

Linseed Oil	40	gallons
Litharge	20	lbs.
Red Lead	20	lbs.

Boil above for 40 hours until it breaks off thin.

Kauri	40	lbs.
Quick Oil	8	gallons

Run the gum, thin with the quick oil, and add to the copper at 400° F. Cool to 250° F., and thin with turps.

JAPAN GOLD SIZE.

Boiled Linseed Oil B	40	gallons
Pale Kauri	75	lbs.
Litharge	20	lbs.
Sugar of Lead	20	lbs.
White Copperas (Dried)	10	lbs.

Heat up the oil in an enamelled iron boiler to 350° F. Run the gum with about 5 gallons of hot oil, cool down a little, and add to the contents of the boiler and well mix. Now add the driers and well stir in. Raise the temperature to 500° F. and

continue boiling six hours. Next morning, heat up to 360°—380° F. *and continue seven hours, well stirring all the time. Cool down* to 250° F. and thin with American turps. to weigh 9 lbs. to the gallon. Strain and tank. This ought to be kept at least three months before sending out.

2ND QUALITY JAPAN GOLD SIZE.

Boiled Oil B	40	gallons
Kauri Chips	40	lbs.
Medium Resin	7	lbs.
Litharge	20	lbs.
Red Lead	10	lbs.
White Copperas (Dried)	10	lbs.
American Turps.	80	lbs.

Process as above.

JAPAN GOLDSIZE.

Melt–	Common Bag Manilla or Kauri Gum	50	lbs.
Add–	Hot Baltic Oil	20	gallons

Raise the temperature to 380° F., introduce slowly 18 lbs. of litharge and 10 lbs. of red lead, also 5 lbs. of lump umber nibs. Raise the temperature to 520° F.; keep at this heat for one hour. If, on cooling, the substances break hard and crisp, it is baked sufficiently. *Take pot from fire, let cool to 300° F. Thin out* with 50 to 60 gallons of turps.

JAPAN GOLD SIZE.

The following recipes give the proportions of *raw* oil *and* driers from the start.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Sulphate of Zinc		0	0	3½
Litharge		0	0	14
Gum Animi		0	0	20
Turpentine	25 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Sulphate of Zinc		0	0	$3\frac{1}{2}$
Litharge		0	0	14
Gum Animi		0	0	10
Gum Kauri		0	0	10
Turpentine	25 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Sulphate of Zinc		0	0	$3\frac{1}{2}$
Litharge		0	0	14
Gum Kauri		0	0	20
Turpentine	25 gallons			

JAPAN GOLD SIZE.

In the following the driers are varied.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Zinc		0	0	7
Red Lead		0	0	14
Litharge		0	0	14
Gum Animi		0	0	20
Turpentine	50 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Zinc		0	0	7
Red Lead		0	0	14
Litharge		0	0	14
Gum Animi		0	0	10
Gum Kauri		0	0	10
Turpentine	50 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	20 gallons			
Sulphate of Zinc		0	0	7
Red Lead		0	0	14
Litharge		0	0	14
Gum Kauri		0	0	20
Turpentine	50 gallons			

FINE JAPAN GOLD SIZE.

		cwt.	qrs.	lbs.
Best Pale Kauri		0	3	20
Double Boiled Oil	30 gallons			
Red Lead		0	0	14
White Copperas		0	0	14
Turps., American	60 gallons			

BEST QUICK GOLD SIZE.

		cwt.	qrs.	lbs.
Best Kauri		0	3	0
Linseed Oil	12 gallons			
American Turps.	20 gallons			

CHEAP GOLD SIZE.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	2	0
Boiled Linseed Oil	8 gallons			
*Stout Linseed Oil Drier..	5 gallons			
Turpentine	20 gallons			

*See Chapter I.

No. 2.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	14
Pale Resin		0	0	14
Boiled Linseed Oil	8 gallons			
Stout Linseed Oil Drier..	5 gallons			
Turpentine	20 gallons			

PALE GOLD SIZE.

No. 1.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Linoleate of Manganese		0	0	10
Linoleate of Lead		0	0	10
Gum Animi		0	0	20
Turpentine	25 gallons			

No. 2.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Linoleate of Manganese		0	0	10
Linoleate of Lead		0	0	10
Gum Animi		0	0	10
Gum Kauri		0	0	10
Turpentine	25 gallons			

No. 3.

		cwt.	qrs.	lbs.
Raw Linseed Oil	14 gallons			
Linoleate of Manganese		0	0	10
Linoleate of Lead		0	0	10
Gum Kauri		0	0	20
Turpentine	25 gallons			

PALE GOLD SIZE.

Pale Kauri	60	lbs.
Linseed Oil	10	gallons
Litharge	12	lbs.
Black Manganese	2	lbs.
Turps.	30	gallons.

Run 60 lbs. pale kauri, add 10 gallons oil, put in large pot. Put driers in and boil until thick. Thin with turps. at 200°F, then tank. Wants well stirring.

BEST PALE GOLD SIZE.

		cwt.	qrs.	lbs.
Best Pale Copal		0	3	0
Linseed Oil	10 gallons			
American Turps.	18 gallons			

DARK GOLD SIZE.

Dark Animi	30	lbs.
Oil	10	gallons
Litharge	8	lbs.
Red Lead	4	lbs.
Burnt Umber	2	lbs.
Turps.	26	gallons

Run 30 lbs. dark animi, add oil. Put all into large pot, add driers all mixed together, boil until thick. Thin with turps. at 200°F, then tank.

DARK GOLD SIZE.

Dark Kauri	70	lbs.
Oil	12	gallons
Litharge	14	lbs.
White Manganese in Oil	2	lbs.
Turps.	36	gallons

Run 70 lbs. dark kauri, add oil. Put in large pot, add driers, litharge only until it is thick, then add white manganese in oil last. Thin with turps. at 200°F, and keep it well stirred.

Gold Size for Special Purposes.

Gold size is used in the arts and manufactures for various special purposes. In the making of flock wall-papers the flock surface is attached to the ground by means of a coat of special oil size.

In bronzing also and in hat making there is a demand for the article.

FLOCKING GOLD SIZE.

Largely used by paper stainers.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	0
Burgundy Pitch		0	0	14
Boiled Linseed Oil	10 gallons			
Stout Terebine	5 gallons			
Turpentine	20 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Kauri Chips		0	0	14
Pale Resin		0	0	14
Burgundy Pitch		0	0	14
Boiled Linseed Oil	10 gallons			
Stout Terebine	5 gallons			
Turpentine	20 gallons			

No. 3.

Linseed Oil	40	gallons
Burnt Turkey Umber	20	lbs.
Red Lead or Litharge	20	lbs.
Gum Kauri	40	lbs.
Gum Thus	40	lbs.
Turps.	80	gallons

No. 4.

Make a batch of best Japan gold size as previously directed, and, after the gum is in, add 20 lbs. Burgundy pitch. Thin down to weigh 9½ lbs. to the gallon instead of 9 lbs.

BRONZING GOLD SIZE.

Japan Gold Size	40	gallons
Carriage Varnish	10	gallons

Mixed cold.

JAPAN (TURPENTINE).

	cwt.	qrs.	lbs.	
Pale Resin	1	0	0	Boil 2 hours
Pale Boiled Linseed Oil 4 gallons				

Cool down and stir in—

Stout Terebine (Oil) ...... 6 gallons

Thin with 16 gallons turps.

JAPAN (BENZINE).

	cwt.	qrs.	lbs.	
Pale Resin	1	0	0	As above
Pale Boiled Linseed Oil . 4 gallons				
Stout Terebine (Oil) .... 6 gallons				

Thin with 10 gallons benzine and 6 gallons shale spirit.

For better qualities of Japan use Kauri gum.

The above are useful for cheap competitive grades and for export.

GOLD SIZE FOR SILK HATS.

No. 1.

Linseed Oil	40	gallons
Kauri Gum	120	lbs.
Litharge	28	lbs.
Red Lead	28	lbs.

Melt the gum and add the hot oil. Grind the driers together and sift in. Boil for two days, until the contents of the pot are of such a consistency that it will roll up like a pill. Cool down to 250° F. and thin with 40 or 50 gallons turps.

CHAPTER IV.

COPAL AND CARRIAGE VARNISHES.

This chapter, the first on varnish making proper in the volume, may appropriately commence with a few useful practical notes on the *modus operandi*. Some of these may have appeared earlier in the volume, but all are so important that reiteration will not be amiss.

Always have a bright red heat under the pot rather than a fierce white one. It is better to run gum steadily rather than quickly, as darkening and bad results will be sure to occur from too fierce a fire. Be sure that all fumes are being well driven off. Should firing of the gases occur, drop on tight cover and place damp sacks around. If this does not remedy matters, pull off cover promptly, and drop in five gallons of cold oil. This will probably damp the flame at once. Keep plenty of dry sand handy in case of fire.

General Process of Varnish Making for Body and Copal Varnishes.

Have gum picked and crushed about the size of nuts, then weigh out about $\frac{3}{4}$ cwt. and place in pot, which must be 4 ft. 10 inches in height, and quite 2 feet 6 inches wide. Now have a bright steady fire in furnace, place pot with gum inside on fire. and watch for rise of varnish. When commencing to rise, watch well, and when about half-way up pot drop in ladle and see if the gum runs off clear. If so, it is almost all run. Now allow it to rise a little more, then have oil, about 5 gallons at 450° F., ready for dropping in pot; put in the whole 5 gallons. The contents

should now drop down again (if they do not do so, drop in 5 gallons of cold oil), then allow to rise once more, and add 10 gallons more of the oil, and so on till all is in. The full time for running a pot and oiling is about 35 minutes. Now keep on fire for another five minutes, until it rises well again. Then remove promptly to cooler for 20 minutes whilst the other pot is running, then, when cool, run over to pump and pump up to storage tank above, then pump up the amount of turps. last. This procedure will clean the pots at the same time.

After the day's workings are pumped up to storage tank above (12 pots per day being a fair average), next day run down into churn, which is directly underneath storage tank, and add the following driers to 350 gallons of varnish :—

	lbs.
White Copperas	56
Litharge	56
Borate of Manganese	7

Churn for 12 hours.

Working on the foregoing principles, the following are typical recipes :—

FINEST BODY VARNISH.

		cwt.	qrs.	lbs.
Best Pale Kauri		0	3	0
Linseed Oil	20 gallons			
American Turps.	15 gallons			

HARD DRYING BODY VARNISH.

		cwt.	qrs.	lbs.
Best Pale Kauri		0	1	14
Best Pale Copal		0	1	14
Linseed Oil	11 gallons			
American Turps.	16 gallons			

FINISHING BODY VARNISH.

		cwt.	qrs.	lbs.
Best Pale Copal		0	3	0
Best Pale Kauri		0	1	14
Linseed Oil	20 gallons			
American Turps.	30 gallons			

BEST HARD DRYING CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Pale Kauri		0	1	14
Medium Copal (Pebble)		0	1	14
Linseed Oil	12 gallons			
American Turps.	17 gallons			

QUICK CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Best Pale Copal		0	3	0
Linseed Oil	4 gallons			
Turps.	20 gallons			

BEST FINISHING CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Pale Copal (Pebble)		0	1	14
Pale Copal (Brazilian)		0	1	14
Linseed Oil	21 gallons			
American Turps.	15 gallons			

FINE ELASTIC CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Pale Kauri		0	1	14
Brazilian Copal		0	1	14
Linseed Oil	20 gallons			
American Turps.	17 gallons			

FINE COPAL CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Dark Kauri		0	3	0
Linseed Oil	20 gallons			
American Turps.	17 gallons			

SUPER. ELASTIC CARRIAGE VARNISH.

		cwt.	qrs.	lbs.
Best Pale Kauri		0	3	0
Linseed Oil	20 gallons			
American Turps.	17 gallons			

The varnishes which belong to the present chapter are among the best that the varnish-maker turns out, although of course there are numerous grades depending on the ultimate use of the varnish and the price that is to be paid for it.

The general process in the following series is the same throughout. First run the gum, then add the oil previously heated, thin with the oil driers mixture (referred to as terebine in the following recipes)—for composition of the latter see Chapters I. and III.—and, finally, the turps. The latter operation should be conducted slowly and carefully.

If solid driers are employed, they are selected according to whether a hard or elastic, dark, or pale varnish is required.

HARD CARRIAGE VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Animi		0	1	0
Raw Linseed Oil	4½ gallons			
Stout Terebine	1 gallon			
Turpentine	4½ gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Animi		0	0	21
Hard White Manilla Copal Gum		0	0	14
Raw Linseed Oil	4½ gallons			
Stout Terebine	1 gallon			
Turpentine	4½ gallons			

No. 3.

			cwt.	qrs.	lbs.
Gum Animi			0	0	14
Hard Manilla Copal Gum Chips			0	0	14
Raw Linseed Oil	4½	gallons			
Stout Terebine	1	gallon			
Turpentine	4½	gallons			

HARD CARRIAGE VARNISH.

No. 1.

			cwt.	qrs.	lbs.
Hard White Manilla Copal Gum			0	1	0
Boiled Linseed Oil	5	gallons			
Stout Terebine	1	gallon			
Turpentine	5	gallons			

No. 2.

			cwt.	qrs.	lbs.
Hard White Manilla Copal Gum			0	0	14
Hard Dark Manilla Copal Gum			0	0	14
Boiled Linseed Oil	5	gallons			
Stout Terebine	1	gallon			
Turpentine	5	gallons			

No. 3.

			cwt.	qrs.	lbs.
Hard Dark Manilla Copal Gum			0	1	0
Boiled Linseed Oil	5	gallons			
Stout Terebine	1	gallon			
Turpentine	5	gallons			

HARD CARRIAGE VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Gum Animi	0	0	14
Hard Manilla Copal	0	0	14
Raw Linseed Oil .... 9 gallons			
Linoleate of Manganese	0	0	2
Linoleate of Lead	0	0	2
Turpentine .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Gum Animi	0	0	14
Hard Manilla Copal	0	0	21
Raw Linseed Oil ...... 9 gallons			
Linoleate of Manganese	0	0	2
Linoleate of Lead	0	0	2
Turpentine .... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
Gum Animi	0	0	14
Hard Manilla Copal Chips	0	0	21
Raw Linseed Oil ...... 9 gallons			
Linoleate of Manganese	0	0	2
Linoleate of Lead	0	0	2
Turpentine .... 20 gallons			

HARD CARRIAGE VARNISH.

Medium Kauri	2	Pots.	56	lbs.
Linseed Oil	2	,,	7	gallons
Litharge	2	,,	2½	lbs.
White Borate Manganese	2	,,	½	lb.
Turps.	2	,,	12	gallons

Run 2–56 lbs. medium Kauri, add 7 gallons oil to each, then put in large pot. Boil till stringy, add driers mixed, thin with turps. at 200°F., then tank.

COPAL CARRIAGE VARNISH.

Medium Copal	1 Pot.	30	lbs.
Linseed Oil		10	gallons
Litharge		2½	lbs.
Black Manganese		5	ozs.
Turps.		10	gallons

Melt 30 lbs. copal, add oil; let it rise, take off fire, add driers mixed together. Thin at 200°F. with turps., and tank it.

CARRIAGE VARNISH.

Gum Animi	90	lbs.
White Copperas	28	lbs.
Litharge	10	lbs.
Clarified Oil	24	gallons
Turpentine	40	gallons

PALE CARRIAGE VARNISH.

Gum Animi	120	lbs.
Sugar of Lead	7	lbs.
Copperas	12	lbs.
Clarified Oil	34	gallons
Turpentine	45	gallons

POLIR OR FRENCH FLATTING FOR UNDER-COATINGS.

2nd Kauri	1 Pot.	56	lbs.
Linseed Oil		7	gallons
Litharge		2½	lbs.
Black Manganese		2	ozs.
White Manganese in Oil		½	lb.
Turps.		16	gallons

Run 56 lbs. 2nd kauri, add oil. Boil up twice, then add arge and manganese together, and then put white borate of nganese in last. Thin with turps. at 200°F., then tank it.

PALE CARRIAGE VARNISH.

Pale Copal	2	Pots.	32	lbs.
2nd Kauri	4	„	44	lbs.
Linseed Oil	6	„	10	gallons
Litharge	6	„	2	lbs.
Black Manganese	6	„	3	ozs.
Turps.	6	„	12	gallons

Run 2–32 lbs. pale copal, add 2–10 gallons oil, put in large pot. Run 4–44 lbs. Kauri., put in large pot. Boil all together, then add driers; thin with turps. at 200°F, then tank it.

PALE HARD DRYING CARRIAGE VARNISH.

Melt– ¾ Scraped Kauri Gum	60	lbs.
Add– Hot Clarified Oil	10	gallons

Weigh out 5 lbs. of lump oxide of black manganese and tie up into a wire net sieve or muslin. Next suspend the bag or net containing the manganese into the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 12½ gallons of turps.

HARD DRYING CARRIAGE VARNISH.

¾ Scraped Kauri	50	lbs.
Copal	10	lbs.
Clarified Linseed Oil	10	gallons
Litharge	1	lb. 14 ozs.
Black Oxide of Manganese	2¼	ozs.
Turps.	12	gallons

The following process is applicable to all varnishes of good quality of the body carriage or copal class :—

BEST BODY COPAL CARRIAGE VARNISH.

Fuse 8 lbs. fine African gum copal, add 2 gallons clarified oil, boil very slowly 4 or 5 hours till quite stringy, and mix with 3½ gallons turps.

This makes the palest and best copal carriage varnish, but is very slow in drying. Driers are therefore added, but are injurious. To avoid use of driers gum animi is used instead of copal, but is less durable and darkens with age. Copal and animi varnish are sometimes mixed, 1 pot of the latter to 2 of the former for a moderately quick drying varnish, and 2 pots of animi to 1 of copal for quicker drying varnish of common quality.

BEST PALE CARRIAGE VARNISH.

Fuse 8 lbs. 2nd sorted African copal, add 2½ gallons clarified oil, boil slowly 4 or 5 hours until stringy, add 5½ gallons turps. mixed with ¼ lb. dried copperas, ¼ lb. litharge, strain and pour off in order to hasten drying. Mix with above while hot 8 lbs. 2nd sorted gum animi, 2½ gallons clarified oil, ¼ lb. dry sugar of lead, ¼ lb. litharge, 5½ gallons turps. This varnish will, if well boiled, dry hard in 4 hours summer, and 6 in winter.

2ND QUALITY CARRIAGE VARNISH.

8 lbs. sorted gum animi, 2¾ gallons clarified oil, 5¼ gallons turps., ¼ lb. litharge, ¼ lb. dried sugar of lead, ¼ lb. dried copperas, boiled and mixed as before.

PALE CARRIAGE VARNISH.

2nd Kauri	2	Pots.	56	lbs.
Copal	2	,,	40	lbs.
Pebble	1	,,	50	lbs.
Linseed Oil................	5	,,	12	gallons
Litharge	5	,,	2½	lbs.
Black Manganese	5	,,	3	ozs.
Turps.	5	,,	12	gallons

Run 1–56 lbs. kauri with 12 gallons oil, put in large pot, then run 2–40 lbs. copal with 12 gallons oil, and then 1–50 lbs. pebble with 12 gallons oil. Put all in large pot and boil all together until stringy, add driers and keep stirred. Thin with turps. at 250°, then tank while hot.

FINISHING BODY VARNISH.

Melt–	Body Gum	50	lbs.
Add–	Hot Clarified Oil	12	gallons

Raise the temperature to 380° F. Weigh out 6 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag or net containing the manganese in the liquid, taking care not to touch the bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 15 gallons of turps.

HARD DRYING BODY VARNISH.

Melt–	Body Gum	60	lbs.
Add–	Hot Clarified Linseed Oil	10	gallons

Raise the temperature to 380° F. Weigh out 5 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag or net containing the manganese in the liquid, taking care not touching bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 12½ gallons of turps.

ELASTIC CARRIAGE VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Gum Animi	0	0	16
Gum Copal	0	0	16
Pale Boiled Linseed Oil .. 10 gallons			
Turpentine 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Gum Copal	0	1	4
Pale Boiled Linseed Oil 10 gallons			
Turpentine 20 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	1	4
Pale Boiled Linseed Oil	10 gallons			
Turpentine	20 gallons			

ELASTIC CARRIAGE VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Zanzibar Gum Copal		0	1	0
Pale Boiled Linseed Oil .	6 gallons			
Turpentine	2 gallons			

No. 2.

		cwt.	qrs.	lbs.
Zanzibar Gum Copal		0	0	14
Zanzibar Gum Copal Chips		0	0	14
Pale Boiled Linseed Oil	6 gallons			
Turpentine	2 gallons			

No. 3.

		cwt.	qrs.	lbs.
Zanzibar Gum Copal Chips		0	1	0
Pale Boiled Linseed Oil	6½ gallons			
Turpentine	2 gallons			

ELASTIC CARRIAGE VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Animi		0	1	0
Raw Linseed Oil	4½ gallons			
Stout Terebine	½ gallon			
Turpentine	4½ gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Animi		0	0	21
Best Pale Gum Kauri		0	0	14
Raw Linseed Oil	4½ gallons			
Stout Terebine	½ gallon			
Turpentine	4½ gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Animi		0	0	14
Gum Kauri		0	0	14
Raw Linseed Oil	4½ gallons			
Stout Terebine	½ gallon			
Turpentine	4½ gallons			

PALE ELASTIC CARRIAGE VARNISH.

Melt–	¾ Scraped Kauri Gum	60	lbs.
Add–	Hot Clarified Oil	12	gallons

Raise the temperature to 380° F. Weigh out 6 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag or net containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240 F. Thin out with 15 gallons of turps.

FINEST ELASTIC CARRIAGE VARNISH.

¾ Scraped Kauri	50	lbs.
Copal	25	lbs.
Clarified Linseed Oil	15	gallons
Litharge	3	lbs.
Black Oxide of Manganese	4	ozs.
Turps.	15 to 17	gallons

PALE CARRIAGE VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Copal		0	0	14
Best Gum Animi		0	0	14
Raw Linseed Oil	9 gallons			
Linoleate of Manganese		0	0	0½
Linoleate of Lead		0	0	0½
Resinate of Manganese		0	0	1
Resinate of Lead		0	0	1
Turpentine	20 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Copal 2nds		0	0	14
Gum Animi 2nds		0	0	14
Raw Linseed Oil	9 gallons			
Linoleate of Manganese		0	0	0½
Linoleate of Lead		0	0	0½
Resinate of Manganese		0	0	1
Resinate of Lead		0	0	1
Turpentine	20 gallons			

HARD BODY VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Copal		0	0	12
Best Gum Animi		0	0	12
Raw Linseed Oil	5½ gallons			
Stout Terebine	1 gallon			
Turpentine	11 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	0	12
2nds Gum Animi		0	0	12
Raw Linseed Oil	5½ gallons			
Stout Terebine	1 gallon			
Turpentine	11 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Animi	....	0	0	12
2nds Gum Kauri	....	0	0	12
Raw Linseed Oil	5½ gallons			
Stout Terebine	1 gallon			
Turpentine	11 gallons			

HARD BODY VARNISH.

No. 1.

		cwt.	*qrs.*	*lbs.*
Best Gum Copal	....	0	0	12
Best Gum Animi	....	0	0	12
Raw Linseed Oil	5½ gallons			
Powdered Litharge	....	0	0	2
Turpentine	11 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal	....	0	0	12
2nds Gum Animi	....	0	0	12
Raw Linseed Oil	5½ gallons			
Powdered Litharge	....	0	0	2
Turpentine	11 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Animi	....	0	0	12
2nds Gum Kauri	....	0	0	12
Raw Linseed Oil	5½ gallons			
Powdered Litharge	....	0	0	2
Turpentine	11 gallons			

HARD BODY VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Copal		0	1	2
Raw Linseed Oil	9 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	14 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	1	2
Raw Linseed Oil	9 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	14 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	0	15
Best Kauri Gum		0	0	15
Raw Linseed Oil	9 gallons			
Resinate of Manganese		0	0	2
Resinate of Lead		0	0	1
Turpentine	14 gallons			

FINISHING BODY VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Animi		0	1	4
Pale Boiled Oil	8 gallons			
Turpentine	7 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Animi		0	1	4
Pale Boiled Oil	8 gallons			
Turpentine	7 gallons			

FINISHING BODY VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Animi		0	0	12
Best Gum Copal		0	0	12
Raw Linseed Oil	8 gallons			
Stout Terebine	½ gallon			
Turpentine	8 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Animi		0	0	12
2nds Gum Copal		0	0	12
Raw Linseed Oil	8 gallons			
Stout Terebine	½ gallon			
Turpentine	8 gallons			

FINISHING BODY VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Copal		0	1	2
Raw Linseed Oil	12 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	10 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	1	2
Raw Linseed Oil	12 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	10 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	1	2
Raw Linseed Oil	12 gallons			
Resinate of Manganese		0	0	2
Resinate of Lead		0	0	1
Turpentine	10 gallons			

PALE BODY VARNISH.

Gum Animi	60	lbs.
White Copperas	6	lbs.
Litharge	3	lbs.
Clarified Oil	12	gallons
Turpentine	18	gallons

QUICK BODY VARNISH.

Gum Animi	90	lbs.
White Copperas	18	lbs.
Litharge	3	lbs.
Clarified Oil	18	gallons
Turpentine	24	gallons

ANIMI BODY VARNISH.

Pale Animi	30	lbs.
Linseed Oil	10	gallons
Litharge	$\frac{3}{4}$	lb.
White Manganese	4	ozs.
Turps.	11	gallons

Melt 30 lbs. pale animi, add 10 gallons oil, let it rise once. Put driers in 550° heat, stir well and thin with turps. at 250°, then tank it hot. Mix driers together before using.

COPAL BODY VARNISH.

Palest Copal	30	lbs.
Linseed Oil	10	gallons
Litharge	1$\frac{1}{2}$	lbs.
White Manganese	2	ozs.
Copperas	3	lbs.
Turps.	10	gallons

Melt 30 lbs. palest copal, add 10 gallons oil, heat it up to 560°, add litharge and white borate manganese mixed, then put in copperas. Thin with turps. at 250°, then tank it while hot.

COPAL BODY VARNISH.

Pale Copal	1	Pot	40 lbs.
Kauri (Dial)	1	,,	40 lbs.
Litharge	2	Pots	2½ lbs.
White Manganese	2	,,	½ lb.
Linseed Oil.................	2	,,	10 gallons
Turps.	2	,,	12 gallons

Run 40 lbs. pale copal, add 10 gallons oil, put into large pot, then run 40 lbs. dial and put it with the copal. Boil up to 540°, add driers mixed, keep well stirred, thin with turps. at 250°, then tank while hot.

BODY VARNISH.

Best Kauri	1	Pot	42 lbs.
Best Copal	1	,,	42 lbs.
Linseed Oil.................	2	Pots	10 gallons
Litharge	2	,,	1½ lbs.
White Borate of Manganese in Oil	2	,,	½ lb.
Turps.	2	,,	14 gallons

Run 42 lbs. best kauri, add 10 gallons oil, heat up to 560°, add litharge only until all in, then put white borate in last. Keep well stirred, thin at 250°; do same with 42 lbs. best copal, then put them in a tank together.

White borate of manganese should be ground in oil, 7 lbs. to the gallon, then, when used, weigh it in scoop as it is with oil, and the same for all recipes where it is stated white manganese in oil.

BODY VARNISH.

Animi	1	Pot	40 lbs.
Copal	1	,,	40 lbs.
Best Kauri	1	,,	40 lbs.
Linseed Oil	3	Pots	32 gallons
Litharge	3	,,	3 lbs.
White Manganese in Oil ..	3	,,	½ lb.
Turps.	3	,,	12 gallons

Run 40 lbs. animi, add 11 gallons oil, heat up to 560°, add litharge only; when all is in add white manganese, same as last recipe. Thin at 150° with turps. Do same with copal and kauri —when all are done put into a tank all together. Keep well-stirred.

BODY VARNISH.

Animi	1	Pot	30	lbs.
Copal	1	,,	30	lbs.
Best Kauri	1	,,	30	lbs.
Linseed Oil	3	Pots	6	gallons
Litharge	3	,,	1½	lbs.
Manganese	3	,,	2	ozs.
Turps.	3	,,	9	gallons

Run 30 lbs. animi, add 6 gallons oil, heat up to 560°, add litharge and manganese mixed. Thin with turps. at 150°, same with copal and kauri. Put all in one tank; keep well stirred.

ANIMI BODY VARNISH.

Best Animi	30	lbs.
Linseed Oil	10	gallons
Copperas	5	lbs.
White Lead	3	lbs.
Turps.	12	gallons

Melt 30 lbs. best animi, add 10 gallons oil, heat up to 500°, add copperas and white lead mixed together. Thin with turps. at 250°, then tank it. Keep well stirred.

COPAL BODY VARNISH.

Best Copal	60	lbs.
Linseed Oil	12	gallons
Litharge	3	lbs.
Copperas	6	lbs.
Turps.	14	gallons

Melt 60 lbs. best copal, add 12 gallons oil, heat up to 480°, add litharge and copperas mixed, stir well. Thin at 260° with turps., keep well stirred.

HARD BODY VARNISH.

No. 1.

Animi	1	Pot	30	lbs.
Pale Kauri	1	,,	60	lbs.
Linseed Oil	3	Pots	8	gallons
Litharge	3	,,	1½	lbs.
Copperas	3	,,	2	lbs.
White Manganese	3	,,	2	ozs.
Turps.	3	,,	9	gallons

Run 30 lbs. animi, add 8 gallons oil, heat up to 560°, add litharge, copperas, and white manganese mixed. Keep well stirred, thin with turps. at 150°; do same with pale kauri, then put all in one tank.

No. 2.

Animi	30	lbs.
Linseed Oil	8	gallons
White Lead	2½	lbs.
Copperas	2½	lbs.
Turps.	9	gallons

Melt 30 lbs. No. 2 animi, add 8 gallons oil, heat up to 560°, add white lead and copperas mixed together. Keep well stirred, thin with turps. at 150°, then tank.

No. 3.

Animi	30	lbs.
Linseed Oil	6	gallons
Litharge	½	lb.
Copperas	2	lbs.
Black Manganese	2	ozs.
Turps.	10	gallons

Run 30 lbs. best animi, add oil, heat up to 560, add litharge and black manganese together, then put in copperas last. Thin with turps. at 150°, then tank.

Copal Varnishes.

The term copal varnish is a somewhat vague one, and may mean a great many different things. All carriage varnishes may be called copal varnishes, but all copal varnishes are not carriage varnishes. As a rule, the good quality copal varnishes are specially adapted for painters' use, and more particularly interior use. They are usually, therefore, hard drying, and not so elastic as the coach-builder's varnishes.

For details of process see commencement of this chapter.

PALE COPAL VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Best Pale Gum Copal	0	1	4
Pale Boiled Linseed Oil .. 8 gallons			
Linoleate of Manganese	0	0	2
Turpentine .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
2nds Gum Copal	0	0	16
Best White Manilla Copal	0	0	16
Pale Boiled Oil .... 8 gallons			
Linoleate of Manganese	0	0	2
Turpentine .... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
2nds Gum Copal	0	0	16
Manilla Copal Chips	0	0	16
Pale Boiled Oil .... 8 gallons			
Resinate of Manganese	0	0	2
Turpentine .... 20 gallons			

PALE COPAL VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Pale Gum Copal		0	1	0
Raw Linseed Oil	5½ gallons			
Stout Terebine	¾ gallon			
Turpentine	7 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	0	21
Best White Manilla Copal		0	0	7
Raw Linseed Oil	5½ gallons			
Stout Terebine	¾ gallon			
Turpentine	7 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	0	21
W. W. Resin		0	0	7
Raw Linseed Oil	5½ gallons			
Stout Terebine	¾ gallon			
Turpentine	7 gallons			

POLISHING COPAL VARNISH.

Great hardness and capacity to take on a fine polish are properties which are essential in these varnishes.

No. 1.

		cwt.	qrs.	lbs.
Best Pale Gum Copal		0	0	12
Best Gum Kauri		0	0	12
Refined Linseed Oil	11½ gallons			
Borate of Manganese		0	0	1½
Turpentine	6½ gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Manilla Copal Chips		0	0	12
Best Gum Kauri		0	0	12
Refined Linseed Oil	11½ gallons			
Borate of Manganese		0	0	1½
Turpentine	6½ gallons			

No. 3.

		cwt.	qrs.	lbs.
Best Gum Kauri		0	0	24
Refined Linseed Oil	11½ gallons			
Borate of Manganese		0	0	1½
Turpentine	6½ gallons			

ELASTIC COPAL VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Best Gum Copal		0	0	12
Best Gum Dammar		0	0	12
Pale Boiled Linseed Oil	4 gallons			
Turpentine	8 gallons			

No. 2.

		cwt.	qrs.	lbs.
2nds Gum Copal		0	0	12
2nds Gum Dammar		0	0	12
Pale Boiled Linseed Oil	4 gallons			
Turpentine	8 gallons			

PALE HARD DRYING COPAL VARNISH.

Melt–	Pale Brazilian Copal Gum	60	lbs.
Add–	Hot Clarified Oil	10	gallons.

Raise the temperature to 380° F. Weigh out 5 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag or net containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 12½ gallons of turps.

PALE ELASTIC COPAL VARNISH.

Melt–	Pale Brazilian Copal Gum	50	lbs.
Add–	Hot Clarified Oil	12	gallons

Raise the temperature to 380° F. Weigh out 6 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag or net containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 15 gallons of turps.

PALE COPAL VARNISH FOR MAPLE.

Pale Copal	1	Pot	30	lbs.
Linseed Oil	1	„	8	gallons
Litharge	1	„	1½	lbs.
White Manganese	1	„	4	ozs.
Turps.	1	„	9	gallons

Melt 30 lbs. pale copal, add 8 gallons oil. Boil up once, add driers slowly, and thin at 200° with turps., then tank.

Mix white manganese with litharge before using.

DURABLE COPAL VARNISH.

Small Copal	1	Pot	30	lbs.
Linseed Oil	1	„	10	gallons.
Litharge	1	„	2½	lbs.
White Borate Manganese	1	„	6	ozs.
Turps.	1	„	10	gallons

Melt 30 lbs. small copal, add oil. Boil up once, add driers slowly; thin with turps. at 200°, then tank.

Mix driers together before using.

COPAL VARNISH FOR MIXING.

Block Copal	1	Pot.	20	lbs.
2nd Kauri	1	,,	10	lbs.
Linseed Oil.................	1	,,	6	gallons
Copperas	1	,,	2	lbs.
Litharge	1	,,	1	lb.
Borate Manganese	1	,,	2	ozs.
Turps.	1	,,	9	gallons

Melt copal and kauri together, add oil; put litharge and manganese in together mixed, then put copperas in last. Boil up once, then add driers; thin with turps. at 200°, and tank hot.

STOUT COPAL VARNISH.

Pale Block Copal	2	Pots.	37	lbs.
2nd Kauri	3	,,	45	lbs.
Linseed Oil.................	5	,,	8	gallons
Litharge	5	,,	2	lbs.
Black Manganese	5	,,	3	ozs.
Turps.	5	,,	9	gallons

Melt 2–37 lbs. block copal, add oil, then melt 3–45 lbs. 2nd kauri and oil, put all together in pot. Boil it until stringy, then add driers mixed together, stir slowly, and thin at 200°; then tank while warm.

CHAPTER IV.

OAK VARNISHES.

The oak varnishes form a numerous class, and all grades are met with from the fine copal oak, suitable for exterior use, and composed of hard gums and genuine materials, to the cheap mixtures of rosin and boiled oil, called, by courtesy, varnish. Yet, as we shall show, a good result can be got even from cheap materials if care is exercised in the manufacture.

Working for Oak Varnish.

The following typical recipe of a rather cheap oak varnish is selected as illustrating the general process of making :—

Kauri Dust or Chips	352	lbs.
Pale Rosin	30	lbs.
Litharge	12	lbs.
Borate of Manganese	2	lbs.
Linseed Oil	40	gallons
Turps.	40	gallons

The plant required is simply a 200-gallon copper, with the ordinary fire-hole arranged with a damper to check heat, and fire should be outside or divided from copper by a wall or sheet iron screen, to prevent accident. Copper should be set in fire-brick.

Put 40 gallons linseed oil in copper, and get heat up to 300° F., and then mix litharge into a paste with 3 gallons of the hot oil, and add to that in copper. Keep well stirred and increase heat slowly to 350° F. until litharge is dissolved and oil darkens in colour. Then slowly add kauri dust, stirring well, and do not allow heat to exceed 400°. The dust will take six hours to properly

dissolve. While gum is dissolving, take 10 gallons of the turpentine and add to it the 30 lbs. rosin in a separate drum or barrel, and agitate it to dissolve. Now add borate manganese to gum in the copper. By this time gum should all be in the copper. Keep heat on until it has quite amalgamated, then draw fire and allow to cool. When cooled down to 90° F., add the balance of the turpentine, stir, and allow a day to settle. Next day add the 10 gallons turpentine which contains the rosin, and put the whole through a sieve, say 60 mesh to the inch, and in two or three weeks it will fit for sale.

We shall now proceed to treat in detail the important varieties of oak varnish.

Hard and Quick-Drying Oak Varnishes.

BEST HARD CHURCH OAK VARNISH.

Good Pale Hard Kauri	22	lbs.
A Oil (see Chap. I.)	13	lbs.
Best American Turps.	5½ to 6	gallons

CHURCH OAK VARNISH.

2nd Kauri	30	lbs.
Linseed Oil	6	gallons
Litharge	2	lbs.
Black Manganese	2	ozs.
Turps.	9	gallons

Run 30 lbs. 2nd kauri, add 6 gallons oil, boil up to 500°, add driers, thin at 150° with turps., stir well.

PALE CHURCH OAK VARNISH.

Medium Pale Kauri	3	Pots.	50	lbs.
Linseed Oil	3	,,	10	gallons
Litharge	3	,,	3	lbs.
Black Manganese	3	,,	½	lb.
Turps.	3	,,	14	gallons

Run 50 lbs. medium pale kauri, add 10 gallons oil. Boil up once, add driers, stir well, thin with turps. at 150°. Same way with other pots.

FINE CHURCH OAK VARNISH.

Kauri	30	lbs.
Copal	10	lbs.
Linseed Oil	8	gallons
Litharge	2	lbs.
Black Manganese	½	lb.
Turps.	10	gallons

Run 30 lbs. 2nd kauri with 10 lbs. copal, add 10 gallons oil. Boil up to 500°, add driers, keep well stirred, thin at 150° heat with turps.

EXTRA PALE CHURCH OAK VARNISH.

Pale Kauri	6	Pots.	40	lbs.
Linseed Oil	6	,,	8	gallons
Litharge			9	lbs.
White Borate			1½	lbs.
Turps.			60	gallons

Run 40 lbs. pale kauri, add 8 gallons oil. Boil up once, add 1½lbs. Litharge, 4 ozs. white manganese, thin with turps. at 150°. Same with all other pots.

CHURCH OAK VARNISH.

Kauri Chips	210	lbs.
Linseed Oil	42	gallons
Litharge	10½	lbs.
White Borate	5½	ozs.
Turps.	52	gallons

Run 5–42 lbs. kauri chips, add oil. Put in large pot, boil up to 500°, add driers mixed, stir well, then add turps. at 200°, then tank.

HARD CHURCH OAK VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Hard Gum Kauri	0	1	4
Raw Linseed Oil	12 gallons		
Stout Terebine	1 gallon		
Turpentine	20 gallons		

No. 2.

		cwt.	qrs.	lbs.
Hard Gum Kauri		0	0	16
Manilla Copal Chips		0	0	16
Raw Linseed Oil	12 gallons			
Stout Terebine	1 gallon			
Turpentine	20 gallons			

DARK CHURCH OAK VARNISH.

		cwt.	qrs.	lbs.
Dark Kauri		0	3	10
Linseed Oil	14 gallons			
American Turps.	17 gallons			

Brazilian copal is often used instead of kauri in church oak varnishes.

BEST HARD FLATTING OAK VARNISH.

		cwt.	qrs.	lbs.
Best Pale Kauri		0	1	14
Best Pale Copal		0	1	14
American Turps.	20 gallons			
Linseed Oil	12 gallons			

QUICK DRYING OAK VARNISH.

		cwt.	qrs.	lbs.
Dark Kauri		0	3	0
Medium Amber Rosin		0	0	14
Linseed Oil	3 gallons			
American Turps.	17½ gallons			

HARD FLOORCLOTH OAK VARNISH.

		cwt.	qrs.	lbs.
Dark Kauri		0	2	0
Medium Copal		0	1	0
Linseed Oil	14 gallons			
American Turps.	18 gallons			

HARD DRYING OAK VARNISH.

Kauri Chips	22	lbs.
A. Oil	12	lbs.
Best American Turps.	$5\frac{1}{2}$ to 6	gallons

HARD OAK VARNISH.

No. 1.

2nd Manilla	56	lbs.
Linseed Oil	8	gallons
Litharge	3	lbs.
Black Manganese	3	ozs.
Turps.	14	gallons

Run 56 lbs. 2nd Manilla, add oil. Boil up till stringy, add driers mixed, stir well, thin with turps. at 150°.

No. 2.

Accra Gum	30	lbs.
Linseed Oil	8	gallons
Litharge	2	lbs.
Black	3	ozs.
Turps.	9	gallons

Melt 30 lbs. Accra gum, add 8 gallons oil. Boil up once, add driers, keep well stirred, and thin with turps. at 150°.

HARD DRYING OAK VARNISH.

Half Scraped Kauri	50	lbs.
Manilla Gum	10	lbs.
Clarified Linseed Oil	10	gallons
Litharge	$2\frac{1}{2}$	lbs.
Oxide of Black Manganese	4	ozs.
Turps.	12	gallons

In making the hot drier, run the gums and add hot oil. Take 3 gallons of oil from every run and put it into boiling pot. Work the oil to 380° F., and introduce litharge according to the number of batches made. Next put the pot on fire and give one heat, and then remove the pot from fire. Add the black manganese last. Let the contents cool to 240°, with turps.

BEST HARD DRYING OAK VARNISH.

Melt–	Half Scraped Kauri Gum	60	lbs.
Add–	Hot Clarified Oil	10	gallons

Raise the temperature to 380° F. Weigh out 5 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off the fire. Let cool to 240° F. Thin out with 12½ gallons of turps.

CHEAPER HARD DRYING OAK VARNISH.

Melt–	Common Bag Manilla Gum	30	lbs.
	Rough Kauri Gum	30	lbs.
Add–	Hot Clarified Oil	10	gallons

Raise the temperature to 380° F. Weigh out 5 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the bag containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 12½ gallons of turps.

HARD DRYING OAK VARNISH.

Half Scraped Kauri	40	lbs.
Pale Manilla Copal	20	lbs.
Hot Linseed Oil	10	gallons
Turps.	12	gallons

HARD DRYING COMMON OAK VARNISH.

Common Kauri	75	lbs.
Hot Linseed Oil	15	gallons
Turps.	15	gallons

DECORATORS' HARD OAK VARNISH.

2nd Manilla	56	lbs.
Linseed Oil	10	gallons
Litharge	2	lbs.
Black Manganese	2	ozs.
Turps.	14	gallons

Melt 56 lbs. 2nd Manilla, add 10 gallons oil. Boil up twice, add driers mixed together, thin with turps. at 150°.

NOTE.—Regarding process for quick oak (also applicable to quick carriage), see Chap. IV.

Extra attention must be given to these, as the turps. have to be got in as quickly as possible; therefore, when gum is well run, take pot from fire to cooler, allow 10 minutes from taking off fire, then add turps. gradually at first, then very briskly, stirring well all the time.

The following indicates the difference in the driers of pale and dark varnishes :—

FOR PALE VARNISHES.

Crude Litharge	3	ozs.
to Oil	1	gallon
Oxide of Black Manganese	$\frac{1}{4}$	oz.
to Oil	1	gallon

FOR DARK VARNISHES.

Crude Litharge	$\frac{1}{4}$	lb.
to Oil	1	gallon
Oxide of Black Manganese	$\frac{1}{2}$	oz.
to Oil	1	gallon

Elastic Oak Varnishes.

These, as their name implies, are more elastic and pliable in their nature; they therefore stand variations in weather better, and are generally for exterior use, or interior use where expansion and contraction are liable to occur. The proportion of gum is much less than in the varnishes of the quick drying class, and much of the value of the product depends on the preparation of the boiled oil and on the correct mixing of the various ingredients.

BEST ELASTIC OAK VARNISH.

Melt– Half Scraped Kauri Gum	60	lbs.
Add– Hot Clarified Oil	12	gallons

Raise the temperature to 380° F. Weigh out 6 lbs. of lump black oxide of manganese and tie up in a wire net sieve or muslin. Next suspend the net or bag containing the manganese in the liquid, taking care not to touch bottom of pot. Then raise the temperature to 450° F. Maintain the heat thirty minutes, and take pot off fire. Let cool to 240° F. Thin out with 15 gallons of turps.

BEST ELASTIC OAK.

Half Scraped Kauri	50	lbs.
Pale Manilla	25	lbs.
Hot Linseed Oil	15	gallons
Turps.	15	gallons

To 180 gallons varnish use driers as under :—

Zinc Sulphate	21	lbs.
Powdered Litharge	18	lbs.

FINEST ELASTIC OAK VARNISH.

Half Scraped Kauri	50	lbs.
Manilla Gum	25	lbs.
Clarified Linseed Oil	15	gallons
Litharge	4	lbs.
Oxide of Black Manganese	6	ozs.
Turps.	15 to 17	gallons

PALE ELASTIC COPAL OAK.

	cwt.	qrs.	lbs.
Pale Kauri	0	1	14
Pale Copal	0	1	14

American Turps.	14 gallons
Linseed Oil	16 gallons

FINE ELASTIC OAK VARNISH.

Manilla Gum	56	lbs.
Clarified Oil	12	gallons
Litharge	3	lbs.
Borate of Manganese in Paste	12	ozs.
Turps.	12 to 15	gallons

CLARIFIED DRYING OIL.

(AS USED IN THE ABOVE AND OTHER RECIPES.)

Baltic Linseed Oil......................	84	gallons

Heated to 500° F. Take off and let cool to 380°, then add—

Raw Copal or Sugar of Lead	7	lbs.

Stir and let settle.

PROCESS FOR CHURNING—METHOD OF MIXING.

Run the gums, add hot linseed oil, give one heat, let rise. Let cool to 240° F. Slack out with turps., add ½ gallon of cold linseed oil after thinning with turps. Strain through a 40-mesh sieve into cans, and turn over into churn next day. To 180 gallons of varnish, weigh out 12½ lbs. of powdered litharge, and 17½ sulphate of zinc. Churn for six hours.

BEST ELASTIC OAK VARNISH.

Good Pale Kauri	23	lbs.
A Oil	20	lbs.
Best American Turps.	5 to 5½	gallons

ELASTIC OAK VARNISH.

Kauri Chips	24	lbs.
A Oil	20	lbs.
Best American Turps.	5 to 5½	gallons

The above varnishes are made according to the following method, which is a general one for varnishes of the class.

The gum should first be chopped up into pieces about the size of walnuts, and all passed through a 1¼-inch sieve. This is done to sort the gum into two sizes. It is much the best plan to have the pieces of gum in each pot cut into about the same size. It does not so much matter whether you run the large or the small ones, but they do not run well together.

Weigh up the gum in pot and place in the round hole over a good clear fire, half coal and half coke. While the gum is getting hot, weigh the oil into a measure or oil jack and place it on the round hole plate beside the pot to get warm. The gum having begun to melt, stir well every few moments until all is dissolved. You can tell when all is dissolved thus: take out the stirrer, and if no small lumps of gum appear on it nor on the top of the froth, it is ready for the oil; if not, stir well a few moments longer. Now place in the thermometer, and if the temperature registers 500°—520° F., take out the thermometer and slowly pour in the warm oil, stirring well until all is in. The varnish must now be kept on the fire from 10 to 15 minutes longer, but not less than 10 minutes. During this time, the thermometer is again put in the varnish, and when the temperature again reaches 500°—520° F.—it will drop a little when pouring in the oil—test it by dropping a little on a piece of clean glass. If it appears quite bright and transparent, remove it to the thinning shop; if it is not, keep it on a few moments longer until it is; but 99 times in a 100 it will be right in about ten minutes. Remove it to the thinning shop, away from any fire, and when it has cooled down to about 400° F., commence slowly pouring in cold turps., and stir gently on the top only. As you get in more turps. and the varnish cools a little more, pour in the turps. quicker, and stir stronger and from the bottom. Strain and tank. Keep one month before sending out. It improves with age.

Copal Oak Varnishes.

The better class oak varnishes, made with the harder copals (not kauri), are often styled copal oaks. It is, however, rather a vague term, and may mean very little as regards real value of a varnish. Compare the three following recipes.

COPAL OAK VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Copal		0	1	4
Boiled Linseed Oil	8 gallons			
Borate of Manganese		0	0	1½
Turpentine	20 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Copal		0	0	16
Manilla Copal		0	0	16
Boiled Linseed Oil	8 gallons			
Borate of Manganese		0	0	1½
Turpentine	20 gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Copal		0	0	16
Pale Resin		0	0	16
Boiled Linseed Oil	8 gallons			
Borate of Manganese		0	0	1½
Turpentine	20 gallons			

PALE COPAL OAK VARNISH.

		cwt.	qrs.	lbs.
Pale Copal		0	3	0
Linseed Oil	15 gallons			
American Turps.	18 gallons			

Inside Oak Varnishes.

These differ from outside varnishes in being quicker drying. Also, as they are not exposed so much to the weather, a softer gum can often be used; they can be made much paler for this reason.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	0
Raw Linseed Oil	4 gallons			
Stout Terebine	½ gallon			
Turpentine	11 gallons			

No. 2.

	cwt.	qrs.	lbs.
Gum Kauri	0	0	14
Manilla Copal Chips	0	0	14
Raw Linseed Oil .... 4 gallons			
Stout Terebine .... ½ gallon			
Turpentine .... 11 gallons			

No. 3.

	cwt.	qrs.	lbs.
Gum Kauri	0	0	14
Pale Resin	0	0	14
Raw Linseed Oil .... 4 gallons			
Stout Terebine .... ½ gallon			
Terpentine .... 11 gallons			

INSIDE OAK VARNISH.

No. 1.

	cwt.	qrs.	lbs.
2nds Gum Animi	0	0	24
Raw Linseed Oil .... 9 gallons			
Linoleate of Manganese	0	0	2
Linoleate of Lead	0	0	1
Turpentine .... 16 gallons			

No. 2.

	cwt.	qrs.	lbs.
2nds Gum Animi	0	0	12
Pale Resin	0	0	12
Raw Linseed Oil .... 9 gallons			
Linoleate of Manganese	0	0	2
Linoleate of Lead	0	0	1
Turpentine .... 16 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Animi		0	0	12
Pale Resin		0	0	12
Raw Linseed Oil	9 gallons			
Resinate of Manganese		0	0	2
Resinate of Lead		0	0	1
Turpentine	16 gallons			

INSIDE OAK VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	0
Boiled Linseed Oil	4 gallons			
Turpentine	12 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Manilla Chips		0	0	14
Boiled Linseed Oil	4 gallons			
Turpentine	12 gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Pale Resin		0	0	14
Boiled Linseed Oil	4 gallons			
Turpentine	12 gallons			

COMMON INSIDE OAK VARNISH.

		cwt.	qrs.	lbs.
Pale Manilla Copal		0	3	0
Medium Amber Rosin		0	1	0
Linseed Oil	19 gallons			
American Turps.	20 gallons			

Outside Oak Varnishes.

More elastic than the inside, and hence contain more oil.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	0
Raw Linseed Oil	7½ gallons			
Stout Terebine	½ gallon			
Turpentine	7½ gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Manilla Copal Chips		0	0	14
Raw Linseed Oil	7½ gallons			
Stout Terebine	½ gallon			
Turpentine	7½ gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Pale Resin		0	0	14
Raw Linseed Oil	7½ gallons			
Stout Terebine	½ gallon			
Turpentine	7½ gallons			

OUTSIDE OAK VARNISH.

No. 1.

		cwt.	qrs.	lbs.
2nd Gum Animi		0	0	24
Raw Linseed Oil	12 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	12 gallons			

No. 2.

		cwt.	qrs.	lbs
2nds Gum Animi		0	0	12
Pale Resin		0	0	12
Raw Linseed Oil	12 gallons			
Linoleate of Manganese		0	0	2
Linoleate of Lead		0	0	1
Turpentine	12 gallons			

No. 3.

		cwt.	qrs.	lbs.
2nds Gum Animi		0	0	12
Pale Resin		0	0	12
Raw Linseed Oil	12 gallons			
Resinate of Manganese		0	0	2
Resinate of Lead		0	0	1
Turpentine	12 gallons			

OUTSIDE OAK VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Kauri		0	1	0
Boiled Linseed Oil	8 gallons			
Turpentine	8 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Manilla Copal Chips		0	0	14
Boiled Linseed Oil	8 gallons			
Turpentine	8 gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Kauri		0	0	14
Pale Resin		0	0	14
Boiled Linseed Oil	8 gallons			
Turpentine	8 gallons			

Pale Oak Varnishes.

PALE OAK VARNISH (ELASTIC).

NO. 1.

No. 2. Kauri	70	lbs.
Hot Oil	12	gallons
Turps.	12	gallons
Driers (one of the terebine mixtures already referred to)	2½	gallons

Thin with turps.

First fuse in the pot 70 lbs. kauri gum; at same time have some good Baltic linseed oil heated to 350° F. in small pot or copper close at hand, and when the gum is fused and melted perfectly clear, pour into the melted gum a little of the oil very steadily while still on the fire (about 2 gallons), and boil clear. This takes two or three minutes, then add a little more hot oil about (two gallons), and still keep boiling. By this time the gum will be in a form to take the remaining 5 gallons, which must be poured steadily in. When all is in, keep the heat up 10 or 15 minutes, and take off the fire and cool down to about 240° F., then add 12 gallons turps. Care must be taken in first commencing this. When the turps. have been well mixed, add the 2½ gallons driers. Strain through fine sieve and let stand in store tank to mature—the longer it stands the brighter and better it will become.

PALE OAK VARNISH.

NO. 1.

		cwt.	qrs.	lbs.
Gum Dammar		0	2	0
Boiled Linseed Oil	2 gallons			
*Stout Terebine	½ gallon			
Turpentine	16 gallons			

*See earlier chapters.

No. 2.

	cwt.	qrs.	lbs.
Gum Dammar	0	1	14
Pale Resin	0	0	14
Boiled Linseed Oil	2 gallons		
Stout Terebine	½ gallon		
Turpentine	16 gallons		

No. 3.

	cwt.	qrs.	lbs.
Gum Dammar	0	1	0
Pale Resin	0	1	0
Boiled Linseed Oil	2 gallons		
Stout Terebine	½ gallon		
Turpentine	16 gallons		

The above are not suitable for outside use.

PALE OAK VARNISH.

Pale Kauri	15 lbs.
2nd Kauri	15 lbs.
Linseed Oil	8 gallons
Litharge	2 lbs.
Black Manganese	2 ozs.
White Borate	2 ozs.
Turps.	9 gallons

Run the two 15 lbs. together, add 8 gallons oil, boil up once, add driers mixed together. Thin with turps. at 150° heat, stir well.

PALE OAK VARNISH.

Common Animi	10 lbs.
Medium Kauri	10 lbs.
Common Copal	17 lbs.
Linseed Oil	10 gallons
Litharge	3 lbs.
White Manganese	½ lb.
Turps.	16 gallons

Run all three gums together, add oil. Boil up to 480°, add driers mixed together, thin with turps. at 150° heat.

PALE OAK VARNISH.

2nd Kauri	30	lbs.
Pale Resin	10	lbs.
Linseed Oil	10	gallons
Litharge	1½	lbs.
Black Manganese	4	ozs.
Turps.	12	gallons

Melt 30 lbs. 2nd kauri with 10 lbs. pale resin, add oil. Boil up to 500°, add driers slowly, and thin with turps. at 150°.

PALE OAK VARNISH.

2nd Copal	4	Pots.	30	lbs.
Medium Kauri	17	,,	30	lbs.
Linseed Oil	21	,,	8	gallons
Litharge	21	,,	2	lbs.
Black Manganese	21	,,	¼	lb.
Turps.	21	,,	9	gallons

Run 30 lbs. copal seconds, add 8 gallons oil. Boil up to 500°, add litharge and black manganese, thin with turps. at 200°. Same with all the rest of the pots, and put all in one tank. Keep well stirred.

PALE OAK VARNISH.

2nd Kauri	30	lbs.
Linseed Oil	6	gallons
Litharge	2	lbs.
Black Manganese	2	ozs.
Copperas	2	lbs.
Turps.	8	gallons

Run 30 lbs. 2nd kauri, add 6 gallons oil. Boil up to 480°, add driers, litharge and black together. Put copperas in last by itself. Add turps. at 150°. Keep well stirred.

PALE OAK VARNISH (VERY DURABLE).

Gum Animi	70	lbs.
White Copperas	28	lbs.
Litharge	10	lbs.
Clarified Oil	28	gallons
Turps.	38	gallons

Cheap Oak Varnishes.

CHEAP OAK VARNISH.

TO CHEAPEN VARNISHES TO SELL AGAIN.

Take 20 gallons dark oak varnish, add 20 gallons of pale rosin oil ; before adding, dissolve 8 lbs. sugar of lead in the rosin oil.

FOR A BETTER QUALITY.

Rosin Oil	15	gallons
Sugar of Lead	7	lbs.
Dark Oak Varnish	25	gallons

ANOTHER METHOD.

Dark Oak Varnish	34	gallons
Rosin Oil	6	gallons
Sugar of Lead	5	gallons

CHEAP OAK VARNISH.

MADE FROM GUM, GENUINE LINSEED OIL AND TURPENTINE.

	cwt.	qrs.	lbs.
Gum Kauri Dust	3	0	16
Linseed Oil, 40 gallons	3	0	24
Turpentine, 40 gallons	3	0	4
Powdered Litharge	0	0	12
Borate Manganese	0	0	2
Pale Rosin	0	1	2

The above yields 90 gallons varnish after settling.

CHEAP VARNISHES.

SUITABLE FOR REDUCING OTHER OAK VARNISHES.

No. 1.

	cwt.	qrs.	lbs.
Pale Rosin	0	1	0
Gutta Percha	0	0	0½
Resinate of Lead	0	0	1
Turpentine 8 gallons			

The gutta percha gives elasticity and corrects the brittle tendency of the rosin.

No. 2.

		cwt.	qrs.	lbs.
Common Resin		0	1	0
Gutta Percha		0	0	0½
Resinate of Lead		0	0	1
Turpentine	8 gallons			

CHEAP PALE VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Pale Resin		0	1	0
Raw Linseed Oil	1½ gallons			
Stout Terebine	½ gallon			
Turpentine	3 gallons			

No. 2.

		cwt.	qrs.	lbs.
Common Resin		0	1	0
Raw Linseed Oil	1½ gallons			
Stout Terebine	½ gallon			
Turpentine	3 gallons			

CHEAP VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Pale Resin		0	1	0
Boiled Linseed Oil	1 gallon			
Resinate of Manganese		0	0	5
Turpentine	8 gallons			

No. 2.

Common Resin		0	1	0
Boiled Linseed Oil	1 gallon			
Resinate of Manganese		0	0	5
Turpentine	8 gallons			

COMMON OAK VARNISH FREE FROM ROSIN.

Common Kauri	2	Pots.	60	lbs.
Linseed Oil	2	,,	10	gallons
Litharge	2	,,	3	lbs.
Black Manganese	2	,,	4	ozs.
Turps.	2	,,	16	gallons

Run 60 lbs. common kauri, add 10 gallons oil, boil up to 500°, add driers mixed, thin at 150° with turps. Same way with other pots.

COMMON OAK VARNISH FREE FROM ROSIN.

Common Manilla	56	lbs.
Linseed Oil	8	gallons
Litharge	2	lbs.
Black Manganese	2	ozs.
Turps.	12	gallons

Run 56 lbs. common Manilla, add oil, boil up twice, add driers, thin with turps. at 150°. Mix driers together before using.

SPECIAL CHEAP OAK VARNISH.

		cwt.	qrs.	lbs.
Gum Kauri Dust	(352 lbs.)	3	0	16
Linseed Oil	(40 gallons)	3	0	24
Turps.	(40 gallons)	3	0	4
Litharge		0	0	12
Borate of Manganese		0	0	2
Pale Rosin	(30 lbs.)	0	1	2

For process follow the description given at the beginning of this chapter.

COMMON OAK VARNISH.

Gum Kauri	120	lbs.
Sugar of Lead	7	lbs.
Litharge	7	lbs.
Clarified Oil	8	gallons
Turps.	39	gallons

The following recipe indicates how the turps. may be superseded with cheaper materials if a cheap product is required. When this is done the oil should be genuine.

CHEAP OAK VARNISH WITH TURPENTINE SUBSTITUTE.

Manilla Chips	25	lbs.
Pale Resin	25	lbs.
Linseed Oil	1	gallon
Benzine	2	gallons
Shale Spirit	1	gallon

Great care required for making this varnish.

CHAPTER VI.

SUNDRY OIL VARNISHES FOR SPECIAL PURPOSES.

Numerous oil varnishes are in constant use which partake of the character of one or other of the classes described in the foregoing chapters, but which are modified to suit special requirements. Among these, one of the leading groups is that of mixing varnishes, of which there are numerous grades, this name being given them owing to their suitability for mixing with paints, etc.

Mixing Varnishes.

No. 1.

	cwt.	qrs.	lbs.
Common Gum Kauri	0	0	14
Pale Rosin	0	0	14
Boiled Linseed Oil .... 2½ gallons			
Benzine .... 2 gallons			
Russian Turpentine ..... 2 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common Gum Kauri	0	0	7
Pale Rosin	0	0	21
Boiled Linseed Oil .... 2½ gallons			
Benzine .... 2 gallons			
Russian Turpentine ..... 2 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common Gum Kauri	0	0	7
Common Rosin	0	0	21
Boiled Linseed Oil .... 2½ gallons			
Benzine .... 2 gallons			
Russian Turpentine .... 2 gallons			

MIXING VARNISHES.

No. 1.

	cwt.	qrs.	lbs.
Common Gum Kauri	0	0	7
Common Rosin	0	0	21
Raw Linseed Oil .... 2 gallons			
Litharge	0	0	1½
Rectified Rosin Spirit ... 5 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common Gum Kauri	0	0	7
Common Rosin	0	0	21
Raw Linseed Oil .... 2 gallons			
Litharge	0	0	1½
Crude Rosin Spirit ...... 5 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common Rosin	0	1	0
Raw Linseed Oil .... 2 gallons			
Litharge	0	0	1½
Crude Rosin Spirit ...... 5 gallons			

QUICK MIXING VARNISH.

	cwt.	qrs.	lbs.
Dark Kauri Gum	0	1	14
Pale Brazilian Copal	0	1	14
Linseed Oil .... 5 gallons			
American Turps. .... 20 gallons			

COMMON MIXING VARNISH.

Manilla Gum	84	lbs.
Clarified Oil	3	gallons
Russian Turps.	8	gallons
Benzine	8	gallons

SPECIALITY MIXING JAPAN VARNISH.

		cwt.	qrs.	lbs.
Orange Shellac		0	2	0
Red Lead		0	2	0
Linseed Oil	25 gallons			
American Turps.	25 gallons			
Borate of Manganese		0	0	12

The above recipe is used for mixing with colours and for grinding stiff paints for coach builders. It dries with a hard, eggshell gloss, and is the body for first-class carriage work. It is chiefly sent abroad to the States and South America to resist the hot climate. The oil must be added very gently to the gum when running, and they must boil together at least 30 minutes before taking pot from fire for adding turps.

Heald Varnish.

LARGELY USED BY COTTON SPINNERS.

No. 1.

		cwt.	qrs.	lbs.
Manilla Copal Gum		0	1	14
Raw Linseed Oil	8 gallons			
Turpentine	8 gallons			
Stout Terebine	1 gallon			
Pale Rosin		1	0	0
Turpentine	12 gallons			

No. 2.

		cwt.	qrs.	lbs.
Manilla Copal Gum		0	1	14
Raw Linseed Oil	12 gallons			
Turpentine	12 gallons			
Stout Terebine	1 gallon			
Common Rosin		1	0	0
Turpentine	12 gallons			

Process.—The rosin and the quantity of turps. given are first made into turpentine varnish (see also Chapter IX.) and the latter is then mixed with the oil, both being previously brought to a temperature of 200° F.

HEALD VARNISH.

Elastic Oak Varnish	20	gallons
Stout Boiled Linseed Oil	1	gallon

SPECIAL HEALD VARNISH.

Kauri Gum	34	lbs.
Thick Prima Oil	18	lbs.
Pale Quick Oil	66	lbs.
Turps.	3	gallons

Process.—Run the gum, add the oil, gently raise the temperature to 500° F. Well stir together, allow to cool to about 250° F., and add turps. If required of thicker consistency omit the turpentine.

PRIMA OIL FOR ABOVE.

Take 150 gallons linseed oil and heat to 300° F. Then add 38 lbs. levigated umber, and work well into the oil. Heat the pan up to 400° F. for five hours, and finish.

PALE QUICK OIL FOR ABOVE.

150 gallons raw linseed oil, 75 lbs. litharge. Heat up to 320° F., then continue to 380° F. for about five hours, and finish.

HEALD VARNISH.

(Another Method.)

Manilla Gum	4	Pots.	40	lbs.
Baltic Oil	4	,,	8	gallons
Turps.	4	,,	8	gallons

Process.—Take rosin 1 cwt., melt, cool, and thin with 6 gallons of turps.; black oxide of manganese, 4 lbs., in a little oil; thin with 12 gallons of turps.; stout terebine, 1 gallon in each pot. Fuse the gum, add oil (hot) and manganese, then add the rosin varnish. Cool to 250° F. and thin with turps. and add the terebine.

No. 2.

Manilla Gum	4	Pots.	40	lbs.
Baltic Oil	4	,,	40	gallons
Turps.	4	,,	40	gallons

Process.—Black oxide of manganese, 1 lb., in a little oil for each pot, and 1 gallon stout terebine to each pot, 1 cwt. rosin thinned with 4 gallons turps., and 12 gallons turps. to thin down with.

SPECIALITY HEALD VARNISH.

This is a mixed varnish. To every 100 gallons of best pale elastic oak varnish add 6 gallons of manganese oil.

For Manganese Oil take—

Linseed Oil	1	ton
White Borate of Manganese, perfectly free from Iron	8	lbs.

Heat 5 gallons of the oil to about 450° F. and add the borate of manganese and continue to heat until all is dissolved. Now in another pan heat the remaining linseed oil to 300° F. and blow in air for about 3 hours, then add the oil with the borate of manganese and continue to heat, blowing in air for about 3 hours longer.

Amber Varnish.

PALE.

Pour 2 gallons clarified oil hot on 6 lbs. pale amber, boil till stringy and mix with 4 gallons turps.; this will work well, and will be found a most hard and durable varnish. It will also improve other copal varnishes when mixed with them, but it dries very slowly, and is but little used on account of expense.

AMBER VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Amber Chips	0	2	0
Pale Boiled Linseed Oil 9 gallons			
Turpentine ... . 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Amber Chips	0	1	14
Pale Gum Copal	0	0	14
Pale Boiled Linseed Oil 9 gallons			
Turpentine .... 12 gallons			

No. 3.

	cwt.	qrs.	lbs.
Amber Chips	0	1	0
Pale Gum Copal	0	0	14
Pale Rosin	0	0	14
Pale Boiled Linseed Oil 9 gallons			
Turpentine .... 12 gallons			

Varnish for Patent Leather.

	cwt.	qrs.	lbs.
Raw Linseed Oil ...... 16 gallons			
Paris Blue	0	0	9
Red Lead	0	0	1
Litharge	0	0	1

Process.—Boil the oil, blue, and chemicals together till the mixture turns dark brown, thickens, and gives off various gases. When sufficiently boiled let cool and settle, when a sediment will form.

The absolutely clear varnish is drawn off, and the leather varnished with it is stoved at a temperature not exceeding 100° F. This process carefully carried out enables the varnish to produce a beautiful gloss characteristic of this article.

The residue largely consists of Paris blue, the particles being coated with a resinous substance soluble in turpentine. If this residue is treated with turpentine the blue may be recovered and used again.

Violin Varnish.

(Compare also Amber Varnish.)

	cwt.	qrs.	lbs.
Prepared Amber	0	0	24
Refined Linseed Oil .. 10 gallons			
Dried White Copperas	0	0	2
Turpentine .... 10 gallons			

Process.—The amber is dissolved in the oil at 380° or 400° F. The copperas is then added, and the temperature kept at 380° for 3 hours. Cool to 250° and thin with the turpentine.

"Prepared amber" is amber melted and then poured into shallow silver-plated iron trays to cool.

(For other Violin Varnishes see Chapter X.)

French Oil Varnish

is a name given to a very pale high-class copal varnish used for interior work of the best kind. It is also called *White Copal for Interior use.* It may be used as an extra pale oil paper varnish. The following is a good recipe :—

Picked Copal	20	lbs.
Bleached Oil	2	gallons
Turps.	3	gallons

Melt the copal very carefully so as not to darken the colour. Add the bleached oil while boiling. Stir well till the mixture is incorporated, then remove from fire and continue stirring till

Wainscot Varnish.

Gum animi (2nd quality) 8 lbs., 3 gallons clarified oil, $\frac{1}{4}$ lb. litharge, $\frac{1}{2}$ lb. sugar of lead, $\frac{1}{4}$ lb. copperas, boiled together till strongly stringy, and then mixed with $5\frac{1}{2}$ gallons turps. It may be darkened by adding a little gold size. Dries in 2 hours in summer, used for house painting and japanning.

PALE WAINSCOT VARNISH.

	cwt.	qrs.	lbs.
Best Pale Copal (Brazilian)	0	3	0
Linseed Oil .... 25 gallons			
American Turps. .... 10 gallons			

Antique Oak Floor Varnish.

Hard Church Oak	10	gallons
Sugar of Lead	3	lbs.

Heat the varnish, dissolve sugar of lead, and add—

Vandyke Brown	2	lbs.

ground in the same varnish. Strain.

Enamel Varnish.

(Also described under Enamels.)

	cwt.	qrs.	lbs.
Best Copal Gum	0	1	0
Refined Linseed Oil .. 3 gallons			
Dried Sulphate of Zinc	0	0	1
Turpentine .... 8 gallons			

Fuse the copal and add the oil (hot), then add the zinc; cool down to 250° F. and add the turps., stirring continually.

TRANSPARENT ENAMEL VARNISH.

	cwt.	qrs.	lbs.
Manilla Copal	0	1	2
Raw Baltic Linseed Oil 3 gallons			
Turpentine .... 7 gallons			

Proceed as above.

The above are used as the base of enamels.

Coburg Varnish

is a quick-drying pale copal varnish used for interior work, papers, etc. The following are typical recipes :—

No. 1.

Best Picked Pale Copal	28	lbs.
Prima Oil	25	lbs.
Litharge (added before oiling)	6	ozs.
Turps.	6	gallons

No. 2.

Best Copal	28	lbs.
Thin Oil	28	lbs.
Flake Litharge	½	lb.
Turps.	7	gallons

No. 3.

Best Copal	28	lbs.
Thick Prima Oil	26	lbs.
Litharge	½	lb.
Turps.	7	gallons

Flatting Varnish.

This term is applied in two distinct senses. First it is used to designate an oil varnish, usually of the carriage or body class, which can be felted or flatted down to prepare the surface for another coat. For this kind reference may also be made to the chapter on carriage varnishes. The term is also applied, however, to a finishing varnish used in interior decoration in which the surface dries with a dead or flat surface. The following are recipes for varnish of this nature :—

No. 1.

Extra Pale Manilla Copal	54	lbs.
Linseed Oil	7	gallons
Turps.	9	gallons
Driers (see next page)	2½	gallons

No. 2.

Manilla Chips, 1st or 2nd Quality ..	50	lbs.
Linseed Oil	11	gallons
Turps.	10	gallons
Driers	$3\frac{3}{4}$	gallons

No. 3.

Manilla Chips (Common)	50	lbs.
Linseed Oil	14	gallons
Turps.	10	gallons
Driers	4	gallons

DRIERS USED IN FOREGOING.

White Copperas	20	lbs.
White Sugar Lead	15	lbs.
Litharge	12	lbs.
Sulphate of Manganese	6	lbs.
Linseed Oil	12	gallons

These proportions may be varied as required, and the mixture may be made hot or cold.

FLAT VARNISH (ANOTHER METHOD).

To a hard drying oak varnish or any suitable oil varnish add about 4 ozs. per gallon of a solution of gum sanderac in methylated spirit. The two solutions will not mix, but if shaken together and then applied to a previously varnished surface, a flat finish will be obtained.

FLAT VARNISH (ANOTHER METHOD).

Copal Varnish	12	gallons

Mix with—

Turps.	46	lbs.
White Wax	6	lbs.

dissolved together. Add—

Quick Lime	4	lbs.

Allow to settle.

BEST EGGSHELL FLATTING VARNISH.

Melt together—

White Wax	5	lbs.
Turps.	5	gallons

in copper running pot on fire till dissolved. Take pot off fire. Then thin out with—

Turps.	10	gallons
Pale Copal Varnish	10	gallons

COMMON EGGSHELL FLATTING VARNISH.

Melt together—

Common Brown Wax	5	lbs.
Turps.	5	gallons

in copper running pot on fire till dissolved. Take pot off fire, thin out with 10 gallons of turps. and 10 gallons of hard drying oak varnish.

COMMON PARIS FLATTING.

Common Kauri or Manilla	56	lbs.
Hot Linseed Oil	7	gallons
Turps.	10	gallons
Terebine	2	gallons

Run gums, add hot oil.

For best quality use best kauri and best copal, half and half.

Undercoating Flatting Varnishes.

No. 1.

			cwt.	qrs.	lbs.
Best Pale Gum Kauri			0	2	0
Refined Linseed Oil	7	gallons			
Stout Terebine	2½	gallons			
Turpentine	9	gallons			

No. 2.

			cwt.	qrs.	lbs.
Best Pale Gum Kauri			0	2	0
Raw Linseed Oil	20	gallons			
Stout Terebine	3½	gallons			
Turpentine	10	gallons			

No. 3.

			cwt.	qrs.	lbs.
2nds Gum Kauri			0	2	0
Raw Linseed Oil	12	gallons			
Stout Terebine	4	gallons			
Turpentine	12	gallons			

UNDERCOATING FLATTING VARNISH.

No. 1.

			cwt.	qrs.	lbs.
Best Pale Manilla Copal			0	2	0
Raw Linseed Oil	7	gallons			
Stout Terebine	2½	gallons			
Turpentine	9	gallons			

No. 2.

			cwt.	qrs.	lbs.
Pale Manilla Copal Chips			0	2	0
Raw Linseed Oil	10	gallons			
Stout Terebine	3	gallons			
Turpentine	10	gallons			

No. 3.

			cwt.	qrs.	lbs.
Common Manilla Copal Chips			0	2	0
Raw Linseed Oil	12	gallons			
Stout Terebine	4	gallons			
Turpentine	12	gallons			

CHEAP UNDERCOATING FLATTING VARNISH.

No. 1.

			cwt.	qrs.	lbs.
Manilla Copal Chips			0	1	14
W. W. Rosin			0	0	14
Gutta Percha			0	0	0½
Stearate of Zinc			0	0	14
Turpentine	14	gallons			

No. 2.

	cwt.	qrs.	lbs.
Manilla Copal Chips	0	1	0
W. W. Rosin	0	1	0
Gutta Percha	0	0	0½
Stearate of Zinc	0	0	14
Turpentine .... 14 gallons			

No. 3.

	cwt.	qrs.	lbs.
W. W. Rosin	0	2	0
Stearate of Zinc	0	0	14
Gutta Percha	0	0	0½
Turpentine .... 14 gallons			

Boat and Yacht Varnishes.

These are exposed to severe influences—rain, strong sun, salt water, etc. They are hard and fairly quick drying varnishes. One of the hard oaks or hard church oaks would do, and an improvement is to add a proportion of pale stout gold size.

A better plan is to combine the oak and gold size mixing during the manufacture of the varnish.

Oil Varnish Stains.

These useful and saleable articles consist of a suitable oil varnish in which is dissolved some colouring matter to communicate a tint like oak, walnut, mahogany, etc., to surfaces treated with the varnish.

For floors, skirtings, and even general woodwork they are very useful, and the painter who has been educated to their use will not readily relinquish them.

The following recipes are for the lower-priced sorts, such as an oilman or jobbing painter would buy, but by using a better varnish for the base still higher grades may be prepared.

VARNISH BASE.

No. 1.

Cheap Oak Varnish	15	gallons
Turps.	2	gallons
Rosin Oil	10	gallons
Sugar of Lead	2	lbs.

MAHOGANY.

Tint base as above with--

Soudan Red	3	lbs.
Oil Black	½	lb.

SATINWOOD.

Turmeric	2	ozs.
Picric Acid	16	ozs.

MAPLE.

To satinwood add—

Bismarck Brown	¼	lb.

ROSEWOOD.

To mahogany add—

Oil Black	¼	lb. extra

EBONY.

To varnish as above add—

Oil Black	1½	lbs.

WALNUT.

To varnish as above add—

Oak Oil Stain	2	lbs.
Oil Black	¼	lb.

OAK.

To varnish as above add—

Oak Oil Stain	1½	lbs.
Picric Acid	¼	lb.

Process.—To make any of the above, boil the oak varnish, add the rosin oil, and sugar of lead, and then the stains gradually. Heat to 100°.

Strain to finish. Must be cool before being packed.

VARNISH BASE.
No. 2.

Boiled Oil	10	gallons
Sugar of Lead	7	lbs.
Sulphate of Manganese	3½	lbs.

Bring to the boil and simmer till the sugar of lead, etc., are dissolved.

Then make the stain. Add ½ quantities of stainers as for No. 1.

VARNISH BASE.

Use— No. 3.

Boiled Oil	7	gallons
Rosin Oil	3	gallons

and treat the same as in No. 2.

OIL VARNISH STAINS.

The following is another base with various tinted derivatives—

Oak Varnish	25	gallons
Rosin Oil	15	gallons

Boil, and as soon as it comes to the boil, add—

FOR MAHOGANY.

Soudan Red	3	lbs.

FOR SATINWOOD.

Picric Acid	2¼	lbs.

FOR OAK.

Oil Brown	1	lb.
Soudan Red	½	lb.

FOR WALNUT.

Aniline Black	1¼	lb.

In 5 gallons oak and 2 gallons satinwood, as above.

Gold Stoving Varnish.

½ Manilla and ½ Kauri (common gum)

3 runs of	56	lbs.
Raw Oil	12	gallons

turned over into boiling-off pot.

Litharge	18	lbs.
Copal or Sugar of Lead	4	lbs.
Black Oxide	4	lbs.
Umber	6	lbs.

Umber put in last. Thin with 50 gallons of turps. or by mixing

Quick Oak	88½	gallons
Gold Size	11½	gallons

THINNINGS TO MIX WITH STOVINGS.

Rosin, Medium	1	cwt.
Polish Turps.	6	gallons
Benzine	30	gallons

Sundry Kauri Varnishes.

PALE 1 K.

Kauri Body Gum	84	lbs.
Clarified Oil	3	gallons
Turps.	18	gallons

Thin down hot.

QUICK 1 K.

Kauri Body Gum	84	lbs.
Clarified Oil	1½	gallons
Turps.	18	gallons

1 K. SPECIAL.

½ or ¾ Scraped Kauri	84	lbs.
Clarified Oil	3	gallons
Polish Turps. (Russian)	8	gallons
Thinnings	8	gallons

3 K.

Kauri, Common	84	lbs.
Clarified Oil	3	gallons
Turps.	15	gallons

4 K.

Kauri, Rough	84	lbs.
Clarified Oil	3	gallons
Polish Turps.	8	gallons
Thinnings	8	gallons

CHAPTER VII.

BLACK VARNISHES.

Black Japans.

The black oil varnishes of most importance are undoubtedly those usually described as black Japans. Their preparation is not altogether an easy task because they must combine the properties of a first-rate wearing oil varnish with those of a durable black. The finest black Japans are not those possessing the densest black colour, because great body may be communicated by using bone pitch or some similar material, while the best black Japan contains asphaltum or bitumen.

For a good black, the pitch must be free from grease. Paraffin pitches contain the most grease and Syrian asphalt or old bitumen the least.

The grease may be extracted by a suitable solvent or killed by some chemical treatment. Boiling with nitric acid for at least 8 hours is an excellent method. Or the pitch may be fused with a little sulphur.

The following is a general process for a fine black Japan.

Naples Asphalt or Bitumen	50	lbs.
Gum Animi	8	lbs.

Melt together and add—

Boiled Oil	12	gallons

Boil 2 hours, then add—

Dark Gum Amber	10	lbs.

Previously melted in —

Linseed Oil	2	gallons

Then add—

Driers	10	lbs.

Boil the whole till uniform and thin with

Turps.	30	gallons

There are numerous modifications of the above, and we now proceed to give various recipes to suit all grades and qualities :—

GENERAL PROCESS FOR JAPAN BLACK.

Place the asphaltum in a large pot, run well, stirring till all dampness is out; then add the oil gradually, *cold.* Now raise heat to 400° F. and gradually add driers. The mixture will probably now rise quickly. Stir all dampness out fast. Keep up heat for about 10 minutes, then gradually cool down to 290° F. and draw fire from under. Then add turps. as quickly as possible.

FINEST BLACK JAPAN.

	cwt.	qrs.	lbs.
Best Asphaltum	1	0	7
American Turps. .... 26 gallons			
Boiled Linseed Oil .... 10 gallons			
Ground Litharge	0	0	14
Black Oxide of Manganese	0	0	7
Red Lead	0	0	3

BLACK JAPAN (2ND QUALITY).

	cwt.	qrs.	lbs.
Medium Rosin	0	3	7
Best Asphaltum	1	2	20
Linseed Oil .... 22 gallons			
American Turps. .... 43 gallons			
Flake Litharge	0	1	0
Black Oxide of Manganese	0	1	0

BEST BLACK JAPAN.

No. 1.

	cwt.	qrs.	lbs.
1—Good Asphaltum	1	0	0
2—Linseed Oil	1	2	0
3—Red Lead	0	0	14
4—Burnt T. Umber	0	0	15

Dissolve No. 1, add No. 2, and heat for half an hour, then add 3 and 4, and boil two or three hours.

BLACK JAPAN.

No. 2.

		cwt.	qrs.	lbs.
Egyptian Asphaltum		1	0	0
Baltic Linseed Oil	28 gallons			
Burnt T. Umber	14 lbs.			
Red Lead	14 lbs.			

Mix the driers together and add or sift in when the asphaltum and oil are boiling. This must be boiled until it will roll up like a pill when the sample is taken out. Then thin with 36 to 40 gallons turps.

BLACK JAPAN.

No. 3.

		cwt.	qrs.	lbs.
Assyrian Asphaltum		1	0	0
Dark Boiled Oil	4 gallons			
Stout Terebine	3 gallons			
Turps.	20 gallons			

BLACK JAPAN.

No. 4.

		cwt.	qrs.	lbs.
Asphaltum (Best)		1	0	0
Dark Boiled Oil	6 gallons			
Stout Terebine	4 gallons			
Turps.	30 gallons			
Prussian Blue		0	0	10

Sweat the asphaltum six hours before boiling; that is, heat at a gentle temperature to expel moisture.

BLACK JAPAN.

No. 5.

1.	Asphaltum	60	gallons
	Linseed Oil	120	gallons

Boil till nearly solid when cold, and add—

2.	Kauri Gum	20	gallons
	Linseed Oil	40	gallons

3. Thin with turps.

BLACK JAPAN.

No. 1.

		cwt.	qrs.	lbs.
Asphaltum		1	0	0
Linseed Oil	4 gallons			
Turps.	6 gallons			
Produces	18 gallons			

No. 2.

		cwt.	qrs.	lbs.
Asphaltum		0	2	0
Bone Pitch		0	2	0
Linseed Oil	4 gallons			
Turps.	6 gallons			
Produces	18 gallons			

No. 3.

		cwt.	qrs.	lbs.
Bone Pitch		0	2	0
Common Asphaltum		0	2	0
Linseed Oil	4 gallons			
Turps.	6 gallons			
Produces	18 gallons			

No. 4.

		cwt.	qrs.	lbs.
Bone Pitch		1	0	0
Linseed Oil	4 gallons			
No. 2 Mineral Naphtha	6 gallons			
Produces	18 gallons			

No. 5.

			cwt.	qrs.	lbs.
Asphaltum (Best)			0	3	0
Bone Pitch			0	1	0
Linseed Oil		3 gallons			
Benzine	5	$7\frac{1}{2}$ gallons			
Shale Spirit	$2\frac{1}{2}$				
Produces		$18\frac{1}{4}$ gallons			

No. 6.

		cwt.	qrs.	lbs.
Common Asphaltum		0	2	0
Bone Pitch		0	2	0
Linseed Oil	3 gallons			
Benzine 5, Shale Spirit $2\frac{1}{2}$	$7\frac{1}{2}$ gallons			
Produces	$18\frac{1}{4}$ gallons			

BLACK JAPAN.

Asphaltum	100	lbs.
Red Lead	3	lbs.
Manganese	3	lbs.
Prepared Oil	13	gallons
Turpentine	30	gallons

Melt the asphaltum in a set pot and add the oil, red lead, and manganese. Boil for four hours, and set aside until next day. Then boil until it sets hard between the fingers. Then, after it is cool, add the turpentine.

BEST BLACK JAPAN.

		cwt.	qrs.	lbs.
Asphaltum		1	0	0
Boiled Linseed Oil		0	1	0
Stout Terebine		0	2	0
Turps.	20 gallons			
Red Lead		0	0	14
Borate Manganese		0	0	14

Melt asphaltum in pan, heat up to 350° F., then stir in boiled oil and further heat up to 400° F. for one hour, stirring the whole time, and gradually adding the red lead and manganese borate; keep the heat at this temperature for an hour longer, allow to cool to 300° F., then add turps. and terebine. Cover up tight and allow to cool, as turps. vapour is very heavy and inflammable. This should not be made near a naked flame.

SUPERFINE BLACK JAPAN.

	cwt.	qrs.	lbs.
Asphaltum	1	1	14
Boiled Oil	0	0	14
Gold Size	0	0	13
Terebine	0	0	10
Turps..	0	0	13
Red Lead	0	0	10
Borate Manganese	0	0	7

Process same as before.

COACHMAKERS' BLACK JAPAN.

These must be hard and durable, hence a proportion of hard copal is usually introduced.

No. 1.

	cwt.	qrs.	lbs.
Best Asphaltum	0	3	0
Gum Animi	0	1	0
Boiled Linseed Oil .... 14 gallons			
Stout Terebine .... 10 gallons			
Turpentine .... 14 gallons			
Prussian Blue	0	0	7

No. 2.

	cwt.	qrs.	lbs.
Best Asphaltum	0	3	0
Swedish Pitch	0	0	14
Gum Animi	0	0	14
Boiled Linseed Oil .... 14 gallons			
Stout Terebine .... 10 gallons			
Turpentine .... 14 gallons			
Prussian Blue	0	0	7

No. 3.

		cwt.	qrs.	lbs.
Best Asphaltum		0	2	0
Swedish Pitch		0	1	21
Gum Animi		0	0	7
Boiled Linseed Oil	14 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			
Prussian Blue		0	0	7

COACHMAKERS' BLACK JAPAN.

No. 1.

		cwt.	qrs.	lbs.
Best Asphaltum		1	0	0
Boiled Linseed Oil	14 gallons			
Japan Gold Size	10 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Asphaltum		0	3	0
Swedish Pitch		0	1	0
Boiled Linseed Oil	14 gallons			
Japan Gold Size	10 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

No. 3.

		cwt.	qrs.	lbs.
Best Asphaltum		0	2	0
Swedish Pitch		0	2	0
Boiled Linseed Oil	14 gallons			
Japan Gold Size	10 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

The following are cheaper grades.

BLACK JAPAN.

No. 1.

		cwt.	qrs.	lbs.
Best Asphaltum		0	3	0
Common Resin		0	1	0
Boiled Linseed Oil	12 gallons			
Red Lead		0	0	7
Sugar of Lead		0	0	7
Japan Gold Size	10 gallons			
Terebine	10 gallons			
Turpentine	12 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Asphaltum		0	2	14
Common Resin		0	1	14
Boiled Linseed Oil	12 gallons			
Red Lead		0	0	7
Sugar of Lead		0	0	7
Japan Gold Size	10 gallons			
Terebine	10 gallons			
Turpentine	12 gallons			

No. 3.

		cwt.	qrs.	lbs.
Best Asphaltum		0	2	0
Common Resin		0	2	0
Boiled Linseed Oil	12 gallons			
Red Lead		0	0	7
Sugar of Lead		0	0	7
Japan Gold Size	10 gallons			
Terebine	10 gallons			
Turpentine	12 gallons			

BLACK JAPAN.

No. 1.

		cwt.	qrs.	lbs.
Best Asphaltum		0	3	0
Gum Kauri		0	1	0
Boiled Linseed Oil	14 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Asphaltum		0	3	0
Manilla Copal Chips		0	1	0
Boiled Linseed Oil	14 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

No. 3.

		cwt.	qrs.	lbs.
Best Asphaltum		0	2	0
Manilla Copal Chips		0	1	0
Common Resin		0	1	0
Boiled Linseed Oil	14 gallons			
Stout Terebine	10 gallons			
Turpentine	14 gallons			

BLACK JAPAN.

No. 1.

		cwt.	qrs.	lbs.
Bone Pitch		0	3	0
Common Resin		0	1	0
Boiled Linseed Oil	4 gallons			
Stout Terebine	2 gallons			
Turpentine	20 gallons			

No. 2.

		cwt.	qrs.	lbs.
Bone Pitch		0	2	0
Common Resin		0	2	0
Boiled Linseed Oil	4 gallons			
Stout Terebine	2 gallons			
Turpentine	20 gallons			

MOCK BLACK JAPAN.

The following are articles of the nature of enamels, which can be easily prepared, and are useful for many purposes, including painters' work, jobbing, retouching, etc. The black pigments must be thoroughly well ground.

No. 1.

Drop ivory black, ground in ½ gold size, ½ pale boiled oil, and thinned with elastic oak varnish (pale).

No. 2.

Drop Ivory Black	1 part
Carbon Black	1 part

Ground in oil stiff, and thinned with stout dammar varnish.

BLACK STOVING VARNISH FOR IRON WARE, SAUCEPANS, ETC.

No. 1.

		cwt.	qrs.	lbs.
Turkish Asphaltum		0	3	7
Bone Pitch		0	0	21
Boiled Linseed Oil	20 gallons			
Litharge		0	0	14
Red Lead		0	0	14
Brown Tar Spirit	20 gallons			

NO. 2.

		cwt.	qrs.	lbs.
Stearine Black		0	0	21
Common Rosin		0	2	0
Bone Pitch		0	1	7
Litharge		0	0	4
Red Lead		0	0	4
Shale Spirit	8 gallons			
Naphtha	8 gallons			

STOVING BLACK JAPAN.

1ST COAT.

To be stoved at 300° F.

		cwt.	qrs.	lbs.
Best Brunswick Black	40 gallons			
Resin Spirit	5 gallons			
Vegetable Black		0	1	0

STOVING BLACK JAPAN.

FINISHING COAT.

To be stoved at 350° F.

No. 1 Black Japan	40 gallons
Hard Church Oak Varnish	40 gallons
Resin Spirit	3 gallons

Brunswick Black.

Many recipes for making this varnish do not mention an important secret, viz., to boil the asphaltum until the moisture is driven off. Take 7 lbs. pitch and 7 lbs. asphaltum, boil in an iron pot for seven to ten hours, with frequent stirring, when all moisture will be expelled. Add 2 gallons boiled oil, previously heated, then add 2½ lbs. red lead and 2½ lbs. litharge, and boil for three hours, or until it will set hard when cooled. Then let it cool down and add 5 gallons turpentine, or as much as will reduce it to the consistency best suited for the purpose required. This varnish should dry in 20 minutes to one hour, according to the state of the atmosphere. The red lead may be left out, but, in

this case, it is necessary to add extra asphaltum and also to vary the quantity of oil. If wanted good and cheap, and 24 hours is not too slow for drying, add more oil and less turps.

There are two kinds of Brunswick black, usually termed *best* and *common* in the trade. The way the best is made is as follows: In an iron boiler, over a slow fire, 90 lbs. foreign asphaltum is boiled for about 13 hours; at the same time, 12 gallons boiled oil is reboiled for 13 hours. During the boiling of the oil, about 12 lbs. litharge is gradually introduced and boiled until it becomes stringy. The boiler containing the oil is then emptied into the boiler containing the asphaltum. They are both boiled together until, upon trial, the mixture will roll into hard pills. The mass is then cooled and mixed with 50 gallons turpentine.

Common Brunswick black is made as follows: 112 lbs. common black pitch and 112 lbs. common asphaltum made from tar are put in an iron boiler and boiled for 32 to 40 hours, by which time the moisture will have evaporated. The mixture is stood for two nights, and, on the third morning, is reboiled. As soon as it boils, 32 gallons boiled oil are added, then 40 lbs. red lead and 40 lbs. litharge are gradually introduced and boiled for 12 hours, or until it will roll quite hard. When ready for mixing, 80 gallons turpentine are introduced, until the whole mass is of proper consistency. This will dry in half an hour if properly boiled.

BRUNSWICK BLACK.

Asphaltum, 45 lbs., boil for six hours over a slow fire; during the same time, boil 6 gallons oil, which has been previously boiled, introducing litharge gradually until stringy, then pour the oil into the boiling asphaltum; boil the mixture until it can be rolled into hard pills, let it cool, and then mix with 25 gallons turps., or as much as will give it proper consistency.

BRUNSWICK BLACK.

Pitch and Asphaltum ....each	25	lbs.

Boil gently for five hours. Add—

Linseed Oil	8	gallons
Litharge and Red Lead	10	lbs.

Boil as before and thin with 20 gallons turps.

BRUNSWICK BLACK.

Melt in a boiler over fire—

Bitumen, Turkish	½	cwt.
Swedish Pitch	20	lbs.

When melted, thin down with 4 gallons American turps., and allow it to stand 24 hours; then add more turps. to the thickness required.

BRUNSWICK BLACK.

Asphaltum Pitch	42	lbs.
Dark Rosin	14	lbs.
Turps.	8	gallons

Put 42 lbs. asphaltum in a pot with 14 lbs. dark rosin, and, when melted, take off fire, and thin with turps. at 200°.

BRUNSWICK BLACK.

Bone Black	1	cwt.
Dark Rosin	½	cwt.
Turps.	20	gallons

Put 1 cwt. bone black in a pot with ½ cwt. dark rosin. When melted, take off fire, add turps. at 200°. If too stout, add more turps.

The following series illustrate how different grades are prepared.

Black Varnishes.

BEST BRUNSWICK BLACK.

	cwt.	qrs.	lbs.
Best Assyrian Asphaltum	1	0	7
Common Assyrian Asphaltum	0	3	0
American Turps. 40 gallons			
Boiled Oil 6 gallons			

BRUNSWICK BLACK.

No. 1.

		cwt.	qrs.	lbs.
Dark Rosin		0	3	0
Common Assyrian Asphaltum		1	0	0
American Turps.	40 gallons			

No. 2.

		cwt.	qrs.	lbs.
Dark Rosin		0	3	0
Stockholm Pitch		0	3	7
American Turps.	10 gallons			
* Mineral Naphtha	20 gallons			

*Add this only when the mixture is thoroughly cool.

BRUNSWICK BLACK.

No. 1.

		cwt.	qrs.	lbs.
Best Asphaltum		1	0	0
Raw Linseed Oil	2 gallons			
Turpentine	18 gallons			

No. 2.

		cwt.	qrs.	lbs.
Best Asphaltum		0	3	0
Bone Pitch		0	1	0
Raw Linseed Oil	2 gallons			
Turpentine	18 gallons			

No. 3.

		cwt.	qrs.	lbs.
Common Asphaltum		0	2	0
Bone Pitch		0	2	0
Raw Linseed Oil	2 [illegible] gallons			
Turpentine	18 gallons			

BRUNSWICK BLACK.

No. 1.

		cwt.	qrs.	lbs.
Bone Pitch		0	3	0
Common Rosin		0	1	0
Terebine	2 gallons			
Turpentine	16 gallons			

No. 2.

		cwt.	qrs.	lbs.
Bone Pitch		0	2	14
Common Rosin		0	1	14
Terebine	2 gallons			
Turpentine	16 gallons			

No. 3.

		cwt.	qrs.	lbs.
Bone Pitch		0	2	0
Common Rosin		0	2	0
Terebine	2 gallons			
Turpentine	16 gallons			

BRUNSWICK BLACK.

No. 1.

		cwt.	qrs.	lbs.
Common Asphaltum		0	3	0
Stearine Pitch		0	1	0
Boiled Linseed Oil	2 gallons			
Terebine	2 gallons			
Turpentine	12 gallons			

No. 2.

		cwt.	qrs.	lbs.
Common Asphaltum		0	2	14
Stearine Pitch		0	1	0
Common Rosin		0	0	14
Boiled Linseed Oil	2 gallons			
Terebine	2 gallons			
Turpentine	12 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common Asphaltum	0	2	0
Stearine Pitch	0	1	0
Common Rosin	0	1	0
Boiled Linseed Oil .... 2 gallons.			
Terebine .... 2 gallons			
Turpentine .... 12 gallons			

Black Ships' Varnishes.

Black varnishes for ship-work and iron-work generally are in great request. Many can be produced very cheaply. The thinners may be varied as well as the gums.

BLACK SHIPS' VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Common Asphaltum	1	0	0
Mineral Naphtha .... 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common Asphaltum	0	3	0
Common Rosin	0	1	0
Mineral Naphtha .... 12 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common Asphaltum	0	2	0
Common Rosin	0	2	0
Mineral Naphtha .... 12 gallons			

BLACK SHIPS' VARNISH.

Tar	40	gallons
Creosote	½	gallon
Naphtha	2	gallons

The above is a good wood preservative.

BLACK SHIPS' VARNISH.

Asphaltum	12	lbs.
Linseed Oil	3	gallons
Terebine	½	gallon

Melt the asphaltum and add the linseed oil hot; boil one hour at 360° F. and cool down to 120°; then stir in the terebine.

BLACK SHIPS' VARNISH.

(Also called Patent Black Varnish.)

	cwt.	qrs.	lbs.
Asphaltum	5	0	0
No. 2 Mineral Naphtha	5	0	0

Asphaltum is melted first, and, after the fire is drawn, the mineral naphtha is stirred in.

This makes an extra good article. Instead of the mineral naphtha, use 2½ cwt. creosote and 2½ cwt. No. 2 mineral naphtha, which make a very good varnish at a cost of about 8½d. per gallon.

Coal tar and tar products enter largely into the composition of some of these varnishes. For example, the following :—

BLACK SHIPS' VARNISH.

No. 1.

Coal Tar	40	gallons
Tar Oil	½	gallon
No. 2 Mineral Naphtha	2	gallons

No. 2.

Coal Tar	40	gallons
Thin Stockholm Tar	1	gallon
Creosote	1	gallon

Process as before.

COACH IRONWORK BLACK VARNISH.

	cwt.	qrs.	lbs.
Common Asphaltum	1	0	0
Swedish Pitch	0	2	7
Boiled Linseed Oil .... 40 gallons			
Crude Tar Spirit .... 40 gallons			
Burnt Umber	0	1	7
Red Lead	0	1	7
Litharge Flake	0	0	7

IMPERIAL BLACK VARNISH.

	cwt.	qrs.	lbs.
Swedish Pitch	1	1	0
Bone Pitch..........................	1	0	0
Dark Rosin	2	2	0
Black Oxide of Manganese	0	0	14
Mineral Naphtha ...... 30 gallons			
Shale Naphtha............140 gallons			

BERLIN BLACK.

	cwt.	qrs.	lbs.
Best Assyrian Asphaltum	1	0	0
Common Assyrian Asphaltum	0	3	7
Turps. .... 48 gallons			
Boiled Oil .... 2 gallons			
Vegetable Black	0	1	14

Add vegetable black when all is cooled down thoroughly, mixing well, then pass all through 100-mesh strainer.

EBONITE BLACK.

	cwt.	qrs.	lbs.
Mineral Naphtha .... 40 gallons			
Best Gilsonite Asphaltum	1	2	0
Pine Essence .... 1 pint			

Churn this in revolving churn for 48 hours, *cold.*

TAR COMPOSITION FOR IRON WORK.

Tar contains free acids which greatly affect iron, and to neutralise these 2—3% of lime is added while the tar is hot. Thus treated, tar adheres well, and forms a coating like varnish. Thinning may be effected by using turps. or coal tar naphtha.

Black Varnishes with Dull Surface.

In certain cases it is desirable from an artistic or a utilitarian point of view to produce a dull or flat face on a black surface. For this reason there is always a demand for flat-drying black varnishes. The surface may be required absolutely dead flat, or it may be preferred with a suspicion of gloss—egg-shell gloss. Such varnishes are usually termed Berlin blacks, and they always contain solid black pigment (usually vegetable black). A little oil may be present, but often the gums are simply dissolved in the spirit (turps., naphtha, etc.), and the vegetable black previously ground in oil or turps. added.

BERLIN BLACK.

(DULL EGG-SHELL SURFACE.)

	cwt.	qrs.	lbs.
Black Stearine Gum	0	3	7
Common Rosin	0	0	21
Litharge	0	0	10
Red Lead	0	0	7
Vegetable Black	0	0	21
Shale Spirit	15 gallons		
Naphtha	20 gallons		

DO. WITH BRIGHT SURFACE.

Dull Egg-shell Black	20 gallons
Best Black Japan	2 gallons

BERLIN BLACK.

Vegetable Black	28	lbs.
Ground Prussian Blue	8	ozs.
Turps.	140	lbs.

Grind till quite fine, then mix with —

Extra Quick-drying Oak Varnish .. 28 gallons

BERLIN BLACK.

Brunswick Black	4	gallons
Turps.	2	gallons
Vegetable Black	2	lbs.

DEAD BLACK VARNISH.

		cwt.	qrs.	lbs.
Japan Gold Size	12 gallons			
Vegetable Black in Oil		0	0	14
Prussian Blue in Oil		0	0	7
Turpentine	8 gallons			

DEAD BLACK STOVING VARNISH.

		cwt.	qrs.	lbs.
Sacking Black (see below)		1	0	0
Spirit Black (Aniline)		0	0	21
Prussian Blue in Oil		0	0	21
Boiled Oil	15 gallons			
Coal Tar Naphtha	14 gallons			

SACKING BLACK.

		cwt.	qrs.	lbs.
Asphaltum		1	0	0
Coal Tar Naphtha	12 gallons			

COMMON SACKING BLACK.

Rosin	4	cwt.
Bone Pitch	2	cwt.
Benzine	72	gallons

BITUMEN VARNISH.

Put into a boiler and melt the following:—

Bitumen, Turkish	28	lbs.
Swedish Pitch	10	lbs.

When melted, add ¼ gallon boiled oil, then take away from fire and add 2 gallons turps. and 2 gallons varnish thinnings, and 4 gallons naphtha.

QUICK DRYING BLACK VARNISH.

Grind 2 cwt. lamp black that has been mixed with ½ linseed oil and ½ varnish thinnings, and thin down with more varnish thinnings, and then add 30 gallons bitumen varnish and 6 gallons linseed oil.

QUICK DRYING BLACK VARNISH.

Take 800 lbs. of resin hardened by sweating, add 100 lbs. of bone black, run up the temperature to, say, 400° F. If convenient, it is as well to let it stand in the kettle over-night. If a set kettle is used, a little fire can be left banked under the kettle and in the morning you will find the kettle ready to thin. Thin at 275° to 250°, adding naphtha very slowly. To this lot should be added 200 to 225 gallons of naphtha, and the result will be a good strong black.

If a stronger and quicker drying black is required, proceed thus:—400 lbs. of rosin, melt, and add slowly 150 lbs. of bone pitch. Add slowly 40 lbs. of black oxide of manganese, and when ready thin at, say, 275°, with a mixture as follows:—

Naphtha	40	gallons
Benzine Drier	40	gallons
Rosin Varnish	40	gallons

This gives a very fine black, and exceedingly quick drying.

If desired, a trifle of well-oxidised linseed oil may be added to the gums when in the process of cooking, before thinning with the naphtha. This, of course, gives toughness, but the cheap goods are not asked to possess much toughness.

A quick drying coating used for wires, etc., is made after this process:—400 lbs. rosin, 125 lbs. bone pitch, 40 lbs. black oxide manganese, thinned with 33⅓ gallons naphtha, 33⅓ gallons naphtha drier, and 33⅓ gallons rosin varnish.

Black Pontypool Varnish.

The varnish that goes by this name is a species of black Japan, and is made after the manner described under that heading.

No. 1.

Raw Linseed Oil	40	gallons
Umber	20	lbs.
Litharge	20	lbs.
Swedish Pitch	40	lbs.
Full Sweated Pitch	40	lbs.
Rosin	20	lbs.

No. 2.

Linseed Oil	40	gallons
Flake Litharge	14	lbs.
Red Lead	14	lbs.
Burnt Turkey Umber	28	lbs.
Swedish Pitch	90	lbs.
Russian Turps.	7	cwt.

Cycle Blacks.

FIRST COATING BLACK CYCLE ENAMEL.

Vegetable Black	4	lbs.
Black Tar	2	gallons
Tar Spirit	2	gallons

FINISHING CYCLE ENAMEL.

Black Tar Varnish	90	lbs.
1st Coating Tar	9	lbs.
Kerosene	9	lbs.
Raw Linseed Oil	½	lb.

CYCLE BLACK (BETTER QUALITY).

4 lbs. vegetable black ground in 2 gallons gold size, and then thinned with 3 gallons gold size and ½ gallon stout dammar varnish.

Stiff Black	7½	lbs.
Ground as follows—		
Gold Size	2	gallons
Carbon Black	1	lb.

Thinned with 5 gallons good oil varnish (best stout oak will do), and 1¼ gallons dammar varnish.

American Black Varnishes.

In the next chapter are given in detail numerous American varnish recipes for all classes of varnishes. It appears convenient, however, to include in the present chapter those which refer to black varnishes or Japans in order that they may be the more readily compared with other methods.

Many American recipes are chiefly of interest as indicating how various oils and thinners may be utilised.

STANDARD BLACK.

Hard Cuban	1,570	lbs.
Black Cuban	500	lbs.
Common Rosin	1,300	lbs.
Benzine	410	gallons
Calcutta Oil	10	gallons

STANDARD BLACK.

Nevada Jet	150	lbs.
Cuban	150	lbs.
Black	100	lbs.
Common Rosin	300	lbs.
Oxide Manganese	24	lbs.
Burnt Umber	10	lbs.
Linseed Oil	1	gallon
Benzine	105	gallons

STANDARD BLACK.

Colophony	150	lbs.
Asphalt	150	lbs.
Oxide Manganese	30	lbs.
Red Lead	5	lbs.
Benzine	75	gallons

STANDARD BLACK.

Asphalt	150	lbs.
Soft Asphalt	150	lbs.
Red Lead	15	lbs.
Linseed Oil	6	gallons
Rosin	100	lbs.
Benzine	65	gallons

STANDARD BLACK.

Rosin	300	lbs.
Soft Asphalt	150	lbs.
Bright Asphalt	150	lbs.
Benzine	90	gallons
Manganese	12	lbs.

VARNISHES FROM WOOD TAR.

No. 1.

Melt 56 lbs. tar in pan and add 1 gallon linseed oil and 3 gallons turps.

No. 2.

Melt 56 lbs. tar in pan, add 1 gallon linseed oil, stir well, and add 2 gallons benzine and 1 gallon shale spirit.

No. 3.

Melt 56 lbs. tar in pan, add 1 gallon linseed oil and 2 gallons No. 2 mineral naphtha.

ASPHALTUM AND WOOD TAR VARNISHES.

No. 1.

Asphaltum	56	lbs.
Wood Tar	28	lbs.
Black Resin	28	lbs.

Melt together and add—

Mineral Naphtha	$2\frac{1}{2}$	gallons
Creosote	$2\frac{1}{2}$	gallons

No. 2.

Asphaltum	56 lbs.
Wood Tar	56 lbs.
Black Rosin	28 lbs.
Shale Spirit	1½ gallons
Benzine	3 gallons

Melt the asphaltum, wood tar, and rosin in the pan, and add the thinnings in the usual way, care being taken in all cases.

No. 3.

Asphaltum	56 lbs.
Coal Tar	28 lbs.
Wood Tar	28 lbs.
Creosote	2½ gallons
No. 2 Mineral Naphtha	2½ gallons

No. 4.

Rosin	56 lbs.
Asphaltum	28 lbs.
Wood Tar	28 lbs.

Thin with 5 gallons rectified tar spirit.

No. 5.

Swedish Pitch	56 lbs.
Rosin	14 lbs.
Wood Tar	14 lbs.
Crude Tar Spirit	2 gallons
Rectified Tar Spirit	2 gallons

No. 6.

Asphaltum	56	lbs.
Swedish Pitch	28	lbs.
Wood Tar	28	lbs.
Common Tar Spirit	5	gallons

WOOD TAR VARNISH.

Wood Tar	56	lbs.
Crude Tar Spirit	1½	gallons
No. 2 Mineral Naphtha	1½	gallons

CHAPTER VIII.

AMERICAN VARNISHES.

In varnish-making, as in many other branches of industry, America is no mean competitor with Britain, and it must be admitted in many cases holds the field. This fact is due, in a great measure, to the American manufacturers catering for the public taste in particular directions. For instance, if the buying public demands a varnish at a given price why should it not be supplied? While the old-fashioned maker is arguing that his goods, though dearer, are intrinsically better than those of his opponent, the American cuts in and takes the order.

The American trade in varnishes in the States and elsewhere in America is somewhat different to the English trade. The varnishes are called by different names, are used in a somewhat different manner, and are of a different composition. This last is due to the difference in climate between America and England.

Much of the success of the Americans in producing cheap and merchantable varnishes is due to the carefully selected and skilfully blended turpentine substitutes they employ. Although America is the source of all the best turps., nowhere are substitutes in more general use than in that country, and it must be admitted that many of the varnishes so compounded are of exceedingly good quality, and are eminently adapted for their specific uses.

We have been to considerable trouble and expense in collecting a very full list of American varnishes, Japans, and drying oils, and now lay the same before our readers in order that they may see in what respects the up-to-date methods of the American continent resemble those of Europe.

The recipes are grouped under the following heads:—

(1.) Drying Oils.
(2.) Prepared Rosin; Driers.
(3.) Japans.
(4.) Coach Varnishes.
(5.) Furniture Varnishes.
(6.) Oil Finishes.
(7.) Flowing Varnishes.
(8.) Rubbing Varnishes.
(9.) Sundry Varnishes for Special Purposes.

The original names and trade terms are employed throughout.

I. Drying Oils for Use in the Subsequent Varnishes.

COACH OIL.

Linseed Oil	100	gallons
Red Lead	15	lbs.
Litharge	10	lbs.
Umber	9	lbs.

COACH OIL.

Linseed Oil	100	gallons
Red Lead	10	lbs.
Litharge	5	lbs.
Umber	9	lbs.

COACH OIL.

Linseed Oil	100	gallons
Litharge	15	lbs.
Red Lead	15	lbs.
Umber	10	lbs.

CALCUTTA COACH OIL.

Calcutta Oil	100	gallons
Red Lead	15	lbs.
Litharge	10	lbs.
Umber	10	lbs.

CALCUTTA COACH OIL.

Calcutta Oil	200	gallons
Oxide of Manganese	50	lbs.

EX. COACH OIL.

Calcutta Oil	113	gallons
Oxide of Manganese	31	lbs.

COACH OIL.

Linseed Oil	115	gallons
Red Lead	10	lbs.
Litharge	5	lbs.
Umber	9	lbs.

COACH OIL.

Linseed Oil	100	gallons
Red Lead	20	lbs.
Litharge	7	lbs.
Umber	9	lbs.

COACH OIL.

Linseed Oil	150	gallons
Oxide of Manganese	50	lbs.

COACH OIL OR BORATE MANGANESE OIL.

Linseed Oil	50	gallons
Borate of Manganese	2	lbs.
Burnt Umber	2	lbs.

COACH OIL OR BORATE MANGANESE OIL.

Linseed Oil	100	gallons
Burnt Umber	5	lbs.
Borate of Manganese	5	lbs.

EX. COACH OIL.

Linseed Oil	100	gallons
Borate of Manganese	12	lbs.
Scale Litharge	2	lbs.

GLOSS OIL.

Rosin	1,000	lbs.
Lime	24	lbs.
Benzine	140	lbs.

FURNITURE OIL.

Linseed Oil	100	gallons
Red Lead	15	lbs.
Litharge	15	lbs.
Burnt Umber	4	lbs.

FURNITURE OIL.

Linseed Oil	50	gallons
Borate Manganese	2	lbs.
Burnt Umber	2	lbs.

FURNITURE OIL.

Linseed Oil	100	gallons
Red Lead	30	lbs.
Litharge	20	lbs.
Umber	15	lbs.

FURNITURE OIL.

Linseed Oil	100	gallons
Red Lead	30	lbs.
Litharge	20	lbs.
Umber	15	lbs.

FURNITURE OIL.

Linseed Oil	190	gallons
Red Lead	95	lbs.
Litharge	47	lbs.
Umber	12	lbs.

FURNITURE OIL.

Linseed Oil	140	gallons
Burnt Umber	7	lbs.
Red Lead	23¼	lbs.
Litharge	23¼	lbs.

FURNITURE OIL.

Linseed Oil	170	gallons
Red Lead	85	lbs.
Litharge	140	lbs.
Umber	11	lbs.

FURNITURE OIL.

Linseed Oil	200	gallons
Red Lead	100	lbs.
Litharge	50	lbs.
Burnt Umber	15	lbs.

FURNITURE OIL.

Linseed Oil	44	gallons
Burnt Umber	5	lbs.
Red Lead	16⅔	lbs.
Litharge	16⅔	lbs.
Calcutta Oil	56	gallons

MANGANESE OIL.

Linseed Oil	100	gallons
Oxide of Manganese	25	lbs.

MANGANESE OIL.

Linseed Oil	30	gallons
Calcutta Oil	30	gallons
Oxide of Manganese	15	lbs.

MANGANESE OIL.

Linseed Oil	115	gallons
Oxide of Manganese	30	lbs.
Umber	10	lbs.

MANGANESE OIL.

Calcutta Oil	30	gallons
Linseed Oil	30	gallons
Oxide of Manganese	15	lbs.

UMBER OIL.

Linseed Oil	11	gallons
Burnt Umber	5½	lbs.

SUGAR OF LEAD OIL.

Linseed Oil	60	gallons
Sugar Lead	150	lbs.
Umber	15	lbs.

SUGAR OF LEAD OIL.

Linseed Oil	71	gallons
Sugar Lead	177	lbs.
Umber	16	lbs.

OXIDE OIL.

Linseed Oil	120	gallons
Oxide Manganese	50	lbs.

OIL SHELLAC OIL.

Linseed Oil	30	gallons
Sugar Lead	75	lbs.
Umber	72	lbs.

II. Rosin Mixtures Used for Cheapening or Diluting.

PREPARED ROSIN.

Linseed Oil	12	gallons
Rosin	384	lbs.
Lime	12	lbs.

ROSIN MIXTURE.

Linseed Oil	15	gallons
Rosin	450	lbs.
Kauri Dust	180	lbs.
Turps.	42	gallons
Benzine	21	gallons

ROSIN MIXTURE.

Linseed Oil	15	gallons
Rosin	450	lbs.
Kauri Dust	180	lbs.
Turps.	42	gallons
Benzine	21	gallons

ROSIN MIXTURE.

Linseed Oil	5	gallons
Kauri Dust	50	lbs.
Rosin	150	lbs.
Turps.	13	gallons
Benzine	7	gallons
Lime	2½	lbs.
Sulph. Zinc	7½	lbs.

ROSIN MIXTURE.

Rosin	300	lbs.
Kauri Dust	120	lbs.
Sulph. Zinc	10	lbs.
Turps.	26	gallons
Benzine	14	gallons

ROSIN MIXTURE.

Rosin	350	lbs.
Oxide of Manganese Oil	3	gallons
Lime	11	lbs.
Turps.	2	gallons
Benzine	30	gallons.

IIa. Drying Mixtures.

FURNITURE MIXING DRIERS.

Kauri Dust	75	lbs.
Furniture Oil	15	gallons
Umber	7	lbs.
Red Lead	40	lbs.
Litharge	20	lbs.
Turps.	70	gallons

FURNITURE DRIERS.

Linseed Oil	24	gallons
Litharge	24	lbs.
Oxide of Manganese	24	lbs.
Rosin	100	lbs.
Turps.	70	gallons
Benzine	58	gallons
Turps. Japan	35	gallons
Kauri Dust	25	lbs.

III. Japans.

TURPS. JAPAN.

Kauri Dust	34	lbs.
Linseed Oil	8	gallons
Burnt Umber	4	lbs.
Rosin	50	lbs.
Oxide of Manganese	12	lbs.
Red Lead	1	lb.
Litharge	1	lb.
Brown Sugar Lead	4	lbs.
Turps.	65	gallons

TURPS. JAPAN.

Linseed Oil	48	gallons
Red Lead	30	lbs.
Oxide of Manganese	30	lbs.
Kauri Dust	100	lbs.
Rosin	200	lbs.
Turps.	130	gallons
Benzine	128	gallons

TURPS. JAPAN.

Linseed Oil	24	gallons
Turps.	70	gallons
Benzine	50	gallons
Oxide of Manganese	25	lbs.
Litharge	25	lbs.
Kauri Dust	25	lbs.
Rosin	100	lbs.

TURPS. JAPAN.

Linseed Oil	45	gallons
Kauri Dust	210	lbs.
Red Lead	165	lbs.
Rosin	150	lbs.
Sugar Lead	15	lbs.
Turps.	180	gallons
Benzine	60	gallons

TURPS. JAPAN.

Kauri Dust	44	lbs.
Manganese Oxide Oil	18	gallons
C. Rosin	20	lbs.
Umber Oil	4	gallons
Oxide Oil	6	gallons
Brown Sugar Lead	½	lb.
Turps.	30	gallons
Benzine	30	gallons

TURPS. JAPAN.

Linseed Oil	25	gallons
Benzine	55	gallons,
Turps.	68	gallons
Red Lead	15	lbs.
Oxide Manganese	25	lbs.
Litharge	15	lbs.
Kauri Dust	50	lbs.
Rosin	100	lbs.

TURPS. JAPAN.

Linseed Oil	24	gallons
Oxide Manganese	24	lbs.
Litharge	24	lbs.
Kauri Dust	48	lbs.
Turps.	80	gallons
Benzine	30	gallons

TURPS. JAPAN.

Linseed Oil	15	gallons
Rosin	30	lbs.
Kauri Dust	70	lbs.
Red Lead	60	lbs.
Turps.	50	gallons
Benzine	20	gallons

TURPS. BAKING JAPAN.

Asphaltum	125	lbs.
Coach Oil	30	gallons
Prussian Blue	5	lbs.
Turps.	25	gallons
Benzine	20	gallons
Cabinet Rubbing	15	gallons

BENZINE JAPAN.

Linseed Oil	25	gallons
Benzine	140	gallons
Litharge	24	lbs.
Kauri Dust	50	lbs.
Rosin	100	lbs.
Turps.	3	gallons

BENZINE JAPAN.

C. Rosin	160	lbs.
Oxide Manganese	60	lbs.
Linseed Oil	32	gallons
Turps.	4½	gallons
Benzine	220	gallons

BENZINE JAPAN.

Linseed Oil	24	gallons
Benzine	120	gallons
Red Lead	15	lbs.
Oxide Manganese	10	lbs.
Rosin	75	lbs.
Kauri Dust	50	lbs.

BENZINE JAPAN.

Kauri Dust	24	lbs.
H. Rosin	50	lbs.
Umber Oil	4	gallons
Linseed Oil	8	gallons
Brown Sugar Lead	4	lbs.
Oxide Manganese	12	lbs.
Red Lead	1	lb.
Litharge	1	lb.
Benzine	6	gallons

BENZINE JAPAN.

Linseed Oil	24	gallons
Oxide Manganese	24	lbs.
Litharge	24	lbs.
Kauri Dust	24	lbs.
Benzine	150	gallons

HEAVY JAPAN.

Linseed Oil	15	gallons
Kauri Dust	70	lbs.
Rosin	30	lbs.
Red Lead	55	lbs.
Best Red Lead	5	lbs.
Turps.	50	gallons
Benzine	20	gallons

COLOPHONY BAKING JAPAN.

Linseed Oil	35	gallons
Cuban Asphalt	300	lbs.
Colophony	1,800	lbs.
Benzine	370	gallons
Umber	4	lbs.

COLOPHONY BAKING JAPAN.

Colophony	800	lbs.
G. Linseed Oil	5	gallons
Blue	5	lbs.
Benzine	175	gallons

IV. Coach Varnishes.

COACH.

No. 1.

Manilla	700	lbs.
Manilla Dust	300	lbs.
Rosin	75	lbs.
Coach Oil	50	gallons
Furniture Oil	30	gallons
Turps.	180	gallons
Benzine	90	gallons

COACH.

No. 1.

Manilla	500	lbs.
Rosin	37½	lbs.
Turps.	90	gallons
Benzine	45	gallons
Coach Oil	25	gallons
Furniture Oil	15	gallons

COACH.

No. 1.

Manilla	150	lbs.
H. Rosin	60	lbs.
Lime	2¼	lbs.
Sulph. Zinc	2½	lbs.
Oxide Oil	12	gallons
Furniture Oil	6	gallons
Benzine	21	gallons
Turps.	21	gallons

N

COACH.

No. 1.

Manilla	750	lbs.
Rosin	175	lbs.
Benzine	75	gallons
Turps.	150	gallons
No. 1 Coach Oil	50	gallons

COACH.

No. 1.

Manilla	750	lbs.
Rosin	275	lbs.
Turps.	150	gallons
Benzine	70	gallons
No. 1 Coach Oil	75	gallons

COACH.

No. 1.

Manilla	1,450	lbs.
Cheap Manilla	750	lbs.
Dust Manilla	300	lbs.
Rosin	188	lbs.
Coach Oil	125	gallons
Furniture Oil	75	gallons
Turps.	450	gallons
Benzine	225	gallons

EXTRA COACH.

No. 1.

Manilla	375	lbs.
H. Rosin	120	lbs.
Kauri 2	129	lbs.
Kauri 1	246	lbs.
Furniture Oil	39	gallons
Borate Oil	39	gallons
Litharge	6	lbs.
Turps.	108	gallons
Benzine	60	gallons

EXTRA COACH.

No. 1.

Manilla Nibs	600	lbs.
Cheap Nibs	300	lbs.
Rosin	672	lbs.
Coach Oil	45	gallons
Furniture Oil	27	gallons
Turps.	162	gallons
Benzine	81	gallons

EXTRA COACH.

No. 1.

Kauri	400	lbs.
Kauri Chips	150	lbs.
Rosin	150	lbs.
Extra Coach Oil	75	gallons
Turps.	160	gallons
Benzine	50	gallons

EXTRA COACH.

No. 1.

Kauri	500	lbs.
Cheap Kauri	100	lbs.
Coach Oil	84	gallons
Turps.	108	gallons
Benzine	30	gallons

EXTRA COACH.

No. 1.

Kauri	700	lbs.
Rosin	35	lbs.
Coach Oil	98	gallons
Turps.	140	gallons
Benzine	30	gallons

EXTRA COACH.

Kauri	600	lbs.
Rosin	30	lbs.
Coach Oil	84	gallons
Turps.	120	gallons
Benzine	30	gallons

COACH.

No. 2.

Manilla	500	lbs.
Cheap Manilla	690	lbs.
H. Rosin	310	lbs.
Coach Oil	100	gallons
Turps.	210	gallons
Benzine	120	gallons

QUICK DRYING COACH.

Kauri	450	lbs.
Kauri Chips	300	lbs.
H. Rosin	225	lbs.
Coach Oil	45	gallons
Benzine	40	gallons
Turps.	147	gallons

QUICK DRYING COACH.

Kauri Chips	300	lbs.
Kauri	450	lbs.
Rosin	175	lbs.
Benzine	25	gallons
Turps.	130	gallons
Coach Oil	45	gallons

V. Furniture Varnishes.

FURNITURE.

No. 1.

Kauri Dust	75	lbs.
Linseed Oil	15	gallons
Umber	7	lbs.
Red Lead	40	lbs.
Litharge	20	lbs.
Turps.	70	gallons

FURNITURE.

No. 1.

Kauri	100	lbs.
Rosin	7½	lbs.
Furniture Oil	5½	gallons
Turps.	24	gallons
Benzine	7	gallons

FURNITURE.

No. 1.

H. Kauri	200	lbs.
Manganese Oil	11	gallons
Rosin	100	lbs.
Furniture Driers	10	gallons
Turps.	56	gallons
Benzine	14	gallons

FURNITURE.

No. 1.

Br. Kauri	400	lbs.
R.S.N. Kauri	400	lbs.
Kauri Dust	400	lbs.
Linseed Oil	66	gallons
Rosin	600	lbs.
Furniture Driers	60	gallons
Turps.	336	gallons
Benzine	84	gallons

FURNITURE.

No. 1.

Manilla Chips	400	lbs.
Manilla Dust	300	lbs.
Rosin	52	lbs.
Furniture Oil	49	gallons
Turps.	126	gallons
Benzine	63	gallons

FURNITURE KAURI.

No. 1.

B. Kauri	400	lbs.
Kauri Dust	200	lbs.
Manganese Oil	33	gallons
Linseed Oil	300	gallons
Furniture Driers	30	gallons
Turps.	168	gallons
Benzine	42	gallons

LIGHT FURNITURE.

No. 1.

Kauri Chips	600	lbs.
Rosin	450	lbs.
Furniture Oil	36	gallons
Turps.	120	gallons
Benzine	75	gallons

LIGHT, FURNITURE.

No. 1.

Kauri Chips	550	lbs.
Rosin	550	lbs.
Furniture Oil	30	gallons
Turps.	110	gallons
Benzine	70	gallons

LIGHT FURNITURE.

No. 1.

Kauri	600	lbs.
Rosin	550	lbs.
Furniture Oil	35	gallons
Turps.	120	gallons
Benzine	80	gallons

LIGHT FURNITURE.

No. 1.

Manilla Nibs	450	lbs.
H. Rosin	450	lbs.
Lime	14	lbs.
Oxide Manganese Oil	18	gallons
Furniture Oil	18	gallons
Turps.	80	gallons
Benzine	80	gallons

LIGHT FURNITURE.

No. 1.

Kauri	600	lbs.
Rosin	372	lbs.
Coach Oil	30	gallons
Turps.	144	gallons
Benzine	42	gallons

EXTRA FURNITURE.

No. 1.

Kauri	200	lbs.
Linseed Oil	11	gallons
Turps.	36	gallons
Benzine	14	gallons

LIGHT FURNITURE.

Kauri I	300	lbs.
P. Kauri	300	lbs.
Rosin	45	lbs.
Coach Oil	36	gallons
Turps.	144	gallons
Benzine	42	gallons

QUICK DRYING FURNITURE.

Manilla Chips	200	lbs.
P. Rosin	15	lbs.
Coach Oil	6	gallons
Heavy Japan	6	gallons
Turps.	40	gallons
Benzine	20	gallons

BENZINE FURNITURE.

Manilla Chips	100	lbs.
P. Rosin	72	lbs.
Coach Oil	3	gallons
Benzine	35	gallons

BENZINE FURNITURE.

Manilla Nibs	1,950	lbs.
H. Rosin	1,625	lbs.
Lime	40	lbs.
Litharge	30	lbs.
Borate Manganese Oil	21	gallons
Furniture Oil	96	gallons
Benzine	520	gallons

BENZINE FURNITURE.

Manilla	475	lbs.
H. Rosin	400	lbs.
Furniture Oil	27	gallons
Benzine	150	gallons

BENZINE FURNITURE.

Manilla	400	lbs.
Rosin	30	lbs.
Sugar Lead	28	lbs.
Benzine	112	gallons

BENZINE FURNITURE.

Manilla Chips	150	lbs.
Rosin	125	lbs.
Lime	3½	lbs.
Furniture Oil	9	gallons
Benzine	45	gallons

BENZINE MANILLA FURNITURE.

Manilla	2,000	lbs.
Rosin	2,000	lbs.
Furniture Oil	96	gallons
Turps.	36	gallons
Benzine	619	gallons

BENZINE KAURI FURNITURE.

Kauri Chips	600	lbs.
H. Rosin	300	lbs.
W. G. Rosin	300	lbs.
Benzine	215	gallons
Turps.	20	gallons
Furniture Oil	40	gallons

BENZINE AND TURPS. FURNITURE.

Br. Kauri	100	lbs.
Furniture Oil	6½	gallons
Turps.	5	gallons
Benzine	22	gallons

VI. Oil Finishes.

HARD OIL FINISH.

H. Kauri	1,400	lbs.
Furniture Driers	200	gallons
Manganese Oil	56	gallons
Rosin	700	lbs.
Turps.	286	gallons
Benzine	112	gallons

HARD OIL FINISH.

H. Kauri	700	lbs.
Furniture Driers	105	gallons
Manganese Oil	28	gallons
Rosin	350	lbs.
Turps.	140	gallons
Benzine	56	gallons

HARD OIL FINISH.

Manilla	600	lbs.
Rosin	175	lbs.
Turps.	120	gallons
Benzine	40	gallons
No. 1 Coach Oil	36	gallons

HARD OIL FINISH.

Manilla	300	lbs.
Rosin	100	lbs.
Turps.	50	gallons
Benzine	18	gallons
No. 1 Coach Oil	18	gallons

HARD OIL FINISH.

Kauri	200	lbs.
Manilla Nibs	480	lbs.
H. Rosin	120	lbs.
Red Lead	18	lbs.
Litharge	18	lbs.
Furniture Oil	24	gallons
Coach Oil	24	gallons
Turps.	90	gallons
Benzine	90	gallons

HARD OIL FINISH.

Br. Kauri	800	lbs.
R.S.N. Kauri	200	lbs.
Furniture Driers	150	gallons
B. Manganese Oil	40	gallons
Rosin	500	lbs.
Turps.	200	gallons
Benzine	80	gallons

HARD OIL FINISH.

Kauri	125	lbs.
Nibs	120	lbs.
H. Rosin	35	lbs.
Red Lead	6	lbs.
Litharge	6	lbs.
Manganese Oxide	8	lbs.
Furniture Oil	8	gallons
Turps.	30	gallons
Benzine	30	gallons

HARD OIL FINISH.

Br. Kauri	500	lbs.
R.S.N. Kauri	100	lbs.
Oil	30	gallons
Furniture Driers	90	gallons
Rosin	270	lbs.
Turps.	120	gallons
Benzine	54	gallons

LIGHT OIL FINISH.

Lump Manilla	460	lbs.
M. Rosin	180	lbs.
Oil	20	gallons
Turps.	48	gallons
Benzine	32	gallons
Furniture Driers	60	gallons

EXTRA LIGHT OIL FINISH.

Kauri Chips	900	lbs.
Rosin	200	lbs.
Coach Oil	60	gallons
Turps.	175	gallons
Benzine	60	gallons

EXTRA LIGHT OIL FINISH.

Manilla	338	lbs.
Rosin	80	lbs.
Turps.	64	gallons
Benzine	20	gallons
Driers	15	lbs.
No. 1 Coach Oil	20	gallons

EXTRA LIGHT OIL FINISH.

Kauri	600	lbs.
Manilla	300	lbs.
Rosin	260	lbs.
Turps.	180	gallons
Benzine	85	gallons
No. 1 Coach Oil	54	gallons

EXTRA LIGHT OIL FINISH.

Kauri	500	lbs.
Manilla	250	lbs.
Rosin	180	lbs.
Turps.	150	gallons
Benzine	75	gallons
Extra Coach Oil	45	gallons
White Driers	10	lbs.

EXTRA LIGHT OIL FINISH.

Kauri	600	lbs.
Manilla	300	lbs.
Rosin	210	lbs.
Turps.	180	gallons
Benzine	85	gallons
No. 1 Coach Oil	78	gallons

VII. Flowing Varnishes.

CHAIR FLOWING.

Manilla	250	lbs.
Kauri Chips	300	lbs.
Kauri	50	lbs.
H. Rosin	130	lbs.
Turps.	100	gallons
Benzine	60	gallons
Furniture Oil	60	gallons

CHAIR FLOWING.

Kauri	75	lbs.
Furniture Oil	15	gallons
Lime	1	lb.
Turps.	23	gallons
Benzine	12	gallons

CHAIR FLOWING.

Kauri	375	lbs.
Nuba	50	lbs.
G. Manilla	200	lbs.
Lime	1	lb.
Rosin	165	lbs.
Turps.	*95*	*gallons*
Benzine	50	gallons
Furniture Oil	54	gallons
Oxide Manganese	$8\frac{1}{2}$	lbs.

EXTRA FLOWING.

Sierra Leone	300	lbs.
Kauri	450	lbs.
Turps.	135	gallons
Benzine	30	gallons
Extra Coach Oil	54	gallons

FLOWING.

X. Kauri	400	lbs.
Zanzibar Chips	200	lbs.
Coach Oil	42	gallons
Turps.	102	gallons
Benzine	18	gallons

VIII. Rubbing Varnishes.

CABINET RUBBING.

Kauri	600	lbs.
H. Kauri	300	lbs.
Furniture Oil	36	gallons
Turps.	144	gallons
Benzine	45	gallons

CABINET RUBBING.

Kauri	500	lbs.
Furniture Oil	20	gallons
Turps.	90	gallons
Benzine	25	gallons

CABINET RUBBING.

Kauri	625	lbs.
B. Oil	35	gallons
Furniture Driers	30	gallons
Turps.	105	gallons
Benzine	36	gallons

CABINET RUBBING.

Kauri	625	lbs.
Furniture Oil	25	gallons
Turps.	115	gallons
Benzine	30	gallons

CABINET RUBBING.

B. Kauri	400	lbs.
Kauri 42	200	lbs.
Furniture Oil	30	gallons
Turps.	134	gallons
Benzine	36	gallons

CABINET RUBBING.

Kauri	625	lbs.
H. Rosin	50	lbs.
Lime	18	ozs.
Oxide Manganese Oil	18	gallons
Furniture Oil	16	gallons
Turps.	100	gallons
Benzine	30	gallons

COACH RUBBING.

L. Kauri	375	lbs.
B. Kauri	375	lbs.
Manganese Oil	36	gallons
Furniture Driers	36	gallons
Turps.	126	gallons
Benzine	36	gallons

MANGANITE RUBBING.

Manilla Nibs	300	lbs.
H. Rosin	24	lbs.
Caustic Soda	12	lbs.
Benzine	35	gallons
Turps.	35	gallons
Manganese Oil	18	gallons

MANGANITE RUBBING.

Manilla	150	lbs.
Rosin	12	lbs.
Caustic Soda	6	lbs.
Manganese Oil	9	gallons
Turps.	20	gallons
Benzine	20	gallons

IX. Sundry Varnishes for Special Purposes.

OIL LABEL VARNISH.

A. Manilla	100	lbs.
W. G. Rosin	50	lbs.
Coach Oil	3	gallons
Benzine	25	gallons

COLOPHONY BAKING VARNISH.

Colophony	860	lbs.
Benzine	200	gallons
Linseed Oil	5	gallons
Blue	5	lbs.

COLOPHONY BAKING VARNISH.

Colophony	1,700	lbs.
Coach Oil	8	gallons
Blue	8	lbs.
Benzine	200	gallons

EXTRA LIGHT COPAL VARNISH.

Pale Manilla	200	lbs.
Coach Oil	12	gallons
Turps.	36	gallons
Benzine	18	gallons
W. G. Rosin	80	lbs.

OIL SHELLAC VARNISH.

Kauri	300	lbs.
Kauri-Chips	200	lbs.
Coach Oil	30	gallons
Turps.	140	gallons
Benzine	60	gallons

STAMP VARNISH.

W. G. Rosin	100	lbs.
Light No. 1 Furniture Varnish	15	gallons
Turps.	10	gallons
Benzine	10	gallons
Dammar	45	lbs.

GEAR VARNISH.

Kauri	750	lbs.
Coach Oil	102	gallons
Turps.	138	gallons

GEAR VARNISH.

Sierra Leone	200	lbs.
North Coast	*200*	*lbs.*
X. X. Kauri	400	lbs.
Coach Oil	188	gallons
Turps.	170	gallons

GEAR VARNISH.

Kauri X.O.	100	lbs.
Sierra Leone	90	lbs.
Turps.	130	gallons
Benzine	18	gallons
Oxide Manganese Oil	107	gallons
Rosin	105	lbs.
Kauri Chips	350	lbs.

GEAR VARNISH.

Sierra Leone	100	lbs.
North Coast	100	lbs.
X.X. Kauri	200	lbs.
Coach Oil	88	gallons
Turps.	84	gallons

ELASTIC GEAR VARNISH.

Kauri	750	lbs.
Borate Manganese Oil	100	gallons
Turps.	138	gallons

ELASTIC GEAR VARNISH.

Kauri	450	lbs.
Sierra Leone	200	lbs.
Rosin	105	lbs.
Extra Coach Oil	170	gallons
Turps.	160	gallons
Benzine	25	gallons

SHOVEL VARNISH.

W. G. Rosin	125	lbs.
Dammar	37	lbs.
Sulph. Zinc	2	lbs.
Turps.	25	gallons
Benzine	10	gallons
Coach Oil	2	gallons

SHOVEL VARNISH.

W. G. Rosin	130	lbs.
Dammar	33	lbs.
Benzine	15	gallons
Turps.	20	gallons
Coach Oil	2	gallons
Sulph. Zinc	2	lbs.

SHOVEL VARNISH.

Dammar	275	lbs.
Cheap Dammar	125	lbs.
W. G. Rosin	200	lbs.
Sulph. Zinc	10	lbs.
Turps.	100	gallons
Benzine	40	gallons
Coach Oil	10	gallons

SHOVEL VARNISH.

W. G. Rosin	112	lbs.
Best Dammar	37	lbs.
Turps.	25	gallons
Benzine	10	gallons
Sulph. Zinc	2	lbs.
Coach Oil	2	gallons

SHOVEL VARNISH.

Dammar	100	lbs.
W. G. Rosin	50	lbs.
Sulph. Zinc	2½	lbs.
Turps.	25	gallons
Benzine	12	gallons
Coach Oil	2	gallons

SHOVEL VARNISH.

Dammar	350	lbs.
Dammar Chips	250	lbs.
W. G. Rosin	390	lbs.
Manganese Oil	3	gallons
Borate Oil	6	gallons
Sulph. Zinc	12	lbs.
Benzine	240	gallons

Process for American Varnishes, follows, in general, the usual process for oil varnishes already given. Where the harder gums are used in the recipes, run the gum, add the oil, stir in the driers, and thin with turps. or other spirit in the order stated. Even in the case of the soft Manilla gums and dammars, the hot process is recommended, but many variations of method will occur to the operator. For example, various drying oils can be stocked, so that they may be added to the melted gums as desired and according to the grade of varnish required. Similarly with the spirit solvents.

PART II.

VARNISHES MADE WITH OTHER MEDIA–TURPS., SPIRIT, Etc.

CHAPTER IX.

TURPENTINE, BENZINE & NAPHTHA VARNISHES.

Although oil is an essential constituent of many varnishes, there are others in which it occupies a secondary place, or in which it may be absent altogether. Chapters IX., X., and XI. are devoted to a consideration of these, and in the present chapter are given details relating to varnishes in which the medium is essentially turpentine or one of its usual substitutes, of which the chief are petroleum spirit or benzine, and coal tar naphtha. Shale spirit and rosin spirit are also used in some cases, but only to a limited extent.

The absence of oil necessarily means that the varnish loses elasticity and durability, but there are compensating advantages. For one thing, varnishes of this class can usually be made by the cold process, which is a simple process of agitation. Again, the varnishes belonging to the class now under discussion are frequently capable of being produced at a very cheap rate, and moreover they fulfil many useful purposes for which oil varnishes would be unsuitable. It will thus be seen that there is great scope for these products.

The first important class is that of the

Dammar Turpentine Varnishes.

Gum dammar is a soft copal, and possesses the property of solubility in nearly every solvent, including turpentine and methylated spirit. It varies in colour from yellow to nearly water white, and should be carefully selected according to the grade of varnish it is desired to make. Dammar varnishes are chiefly used as paper varnishes (the best quality being termed *crystal paper varnishes*), and as varnishes for enamels.

FINEST CRYSTAL PAPER VARNISH.

Turpentine	$6\frac{1}{2}$	gallons
Picked Dammar	41	lbs.

Agitate in churn till dissolved, and stand till all sediment is deposited.

NOTE.—All dammar varnishes possess a slight turbidity or opalescence which cannot be entirely removed.

CRYSTAL PAPER VARNISH.

	cwt.	qrs.	lbs.
Palest French Rosin	0	2	0
Pale Gum Dammar	1	0	4
American Turps. ...... 24 gallons			

WHITE PAPER VARNISH.

Turps.	25	gallons
Dammar	150	lbs.
Pale Rosin	$12\frac{1}{2}$	lbs.

WHITE PAPER VARNISH.

Gum Dammar	40	lbs.
Clarified Oil	3	gallons
Turps.	60	gallons

This is advantageously blended hot.

BEST PAPER VARNISH.

	cwt.	qrs.	lbs.
Gum Dammar	3	1	11
Turps. .... 37 gallons			

DAMMAR VARNISH.

	cwt.	qrs.	lbs.
Gum Dammar	3	3	3
Turps. .... 53 gallons			
Add last—			
Linseed Oil .... 2 gallons			

PALE DAMMAR VARNISH.

	cwt.	qrs.	lbs.
Best Pale Gum Dammar	1	1	0
American Turps. .... 22 gallons			

STOUT DAMMAR VARNISH.

	cwt.	qrs.	lbs.
Best Gum Dammar	1	2	0
American Turps. .... 20 gallons			

BEST PAPER VARNISH (HOT PROCESS).

Best Dammar	68	lbs.
Turps.	10	gallons

Put 68 lbs. best dammar in pot, put the turps. with it. Put on a slow fire until all is melted. If too stout add more turps.

The following are American recipes for dammar varnish :—

DAMMAR VARNISH.

Dammar	280	lbs.
Rosin	75	lbs.
Sulphate of Zinc	5	lbs.
Turps.	17	gallons
Benzine	19	gallons

DAMMAR VARNISH.

Dammar	101	lbs.
W. G. Rosin	30	lbs.
Turps.	24	gallons
Benzine	5	gallons
Sulph. Zinc	2	lbs.

DAMMAR VARNISH.

Dammar	100	lbs.
Common Dammar	80	lbs.
Rosin	75	lbs.
Sulph. Zinc	4	lbs.
Turps.	28	gallons
Benzine	11	gallons

DAMMAR VARNISH.

Dammar	300	lbs.
Turps.	46	gallons
Benzine	14	gallons

Turpentine Varnishes.

(COLD PROCESS).

CRYSTAL VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Best Pale Gum Dammar	1	2	0
Turpentine .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
2nd Quality Gum Dammar	1	2	0
Turpentine .... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
2nd Quality Gum Dammar	1	0	0
Powdered W. W. Resin	0	2	0
Turpentine .... 20 gallons			

No. 4.

	cwt.	qrs.	lbs.
2nd Quality Gum Dammar	0	3	0
Powdered W. W. Resin	0	3	0
Turpentine .... 20 gallons			

PAPER VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Best Pale Gum Dammar	1	0	0
Turpentine .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
2nd Quality Gum Dammar	0	2	21
Powdered W. W. Resin	0	1	7
Turpentine .... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
2nd Quality Gum Dammar	0	2	0
Powdered Pale Resin	0	2	0
Turpentine .... 20 gallons			

STAMPERS' VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Best Pale Gum Dammar	0	3	0
Turpentine .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Dammar Siftings	1	2	14
Turpentine .... 20 gallons			

Process.—As in crystal varnishes.

PAPER EMBOSSERS' VARNISH.

	cwt.	qrs.	lbs.
Dammar	1	1	0
W. G. Rosin	0	2	0
Turps.	1	2	11

Produces 32 gallons.

To three gallons of above add—

Pale Copal Oak Oil Varnish	$3\frac{1}{2}$ gallons
Pale Terebine	$1\frac{1}{2}$ gallons

CRYSTAL VARNISH FOR ENAMELS, ETC.

(HOT PROCESS).

	cwt.	qrs.	lbs.
Pale Dammar Gum	0	3	7
Virgin Rosin	0	0	18
Turps. .... 19 gallons			

Run gum and rosin together, and add turps. slowly.

WHITE VARNISH.

Best Dammar	8	lbs.
Turps.	1	gallon
Oxalic Acid	2	ozs.

IMITATION COBURG VARNISH.

Crystal Varnish (by one of the processes already given)	15	gallons
Extra Pale Gold Size	1	gallon

Varnish for Enamels.

One or other of these may be used according to circumstances :—

CRYSTAL VARNISH FOR WHITE ENAMELS.

NO. 1.

	cwt.	qrs.	lbs.
Finest Dammar Gum	0	3	7
W.W. Pale Resin	0	0	18
Turps.	19 gallons		

Churn till dissolved ; then put into copper jacket pan and heat to 300° F., allow to settle, and cool gradually.

NO. 2.

Dammar Gum	8	lbs.
Turps.	1	gallon

NOTE.—A complete list is given under Enamels.

Mastic Varnishes

are another group of turpentine varnishes. Their chief use is the varnishing of pictures.

The following yields a very fine varnish :—

Luke-warm Turps.	2	gallons
Pale Picked Mastic	5	lbs.
Dry Crushed Glass	3	lbs.

Dissolve by agitation.
Settle, strain, and age for 12 months.
If chilled, add 1 lb. hot silica per gallon.
Shake, and allow to settle.

MASTIC VARNISH.

No. 1.

		cwt.	qrs.	lbs.
Gum Mastic		0	0	20
Turpentine	4 gallons			

No. 2.

		cwt.	qrs.	lbs.
Gum Mastic		0	0	10
Finest Gum Dammar		0	0	10
Turpentine	6 gallons			

No. 3.

		cwt.	qrs.	lbs.
Gum Mastic		0	0	10
Finest Gum Dammar		0	0	10
W. W. Resin		0	0	5
Turpentine	8 gallons			

FOR VALUABLE PAINTINGS.

Mastic, Cleaned	12	ozs.
Turps.	1½	ozs.
Camphor	½	oz.
Glass Powder	5	ozs.
Turpentine	36	ozs.

KAURI VARNISH.

Kauri Dust	50	lbs.
Polish Turps.	2	gallons
Rectified Naphtha	8	gallons

Made cold.

Rosin Varnishes.

These are of two kinds (1) those made by a hot process, and which are chiefly used for mixing with and cheapening oil varnishes, (2) those made by a cold process. To the latter the name ***bright varnish*** is often given, and if the turps. be replaced by rosin oil and rosin spirit we have *pine varnish.*

ROSIN VARNISHES (FOR MIXING WITH AND CHEAPENING OIL VARNISHES.)

The rosin varnishes are made by sweating, that is, rendering fluid by heat and keeping so for a certain length of time, the rosin, with in some cases a small amount of linseed oil, and when cooled down to a temperature of from 100° F. to 180° F., not any higher, adding the spirits with continual stirring. These varnishes are used alone for various purposes, especially those containing naphtha, but are more often used, especially those containing turpentine, for cheapening other varnishes. Owing to their inflammable nature, great care should be exercised in the manufacture and storage.

No. 1.

		cwt.	qrs.	lbs.
W. W. Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Turpentine	6 gallons			

No. 2.

		cwt.	qrs.	lbs.
Pale Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Turpentine	6 gallons			

No. 3.

		cwt.	qrs.	lbs.
Gommon Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Turpentine	6 gallons			

THE SAME WITHOUT OIL.

No. 1.

		cwt.	qrs.	lbs.
W. W. Rosin		1	0	0
Turpentine	6 gallons			

No. 2.

		cwt.	qrs.	lbs.
Pale Rosin		1	0	0
Turpentine	6 gallons			

No. 3.

		cwt.	qrs.	lbs.
Common Rosin		1	0	0
Turpentine	6 gallons			

Turpentine varnish is the usual trade term for the above varnishes.

Similar varnishes are prepared in which turps. is abolished in favour of some cheaper material.

MINERAL ROSIN VARNISH.

		cwt.	qrs.	lbs.
Pale Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Benzine	4 gallons			
Shale Spirit	2 gallons			

Sweat the rosin and oil together, cool down to 180° F., and stir in the spirits. Must be away from fire, preferably in open air.

MINERAL ROSIN VARNISH.

Rosin	160	lbs.
Boiled Oil	3	gallons
Turps.	4	gallons
Petroleum Spirits	16	gallons

Melt the rosin and stir in the boiled oil; when cool a little, add the turps. and petroleum spirit slowly.

MINERAL ROSIN VARNISHES.

No. 1.

		cwt.	qrs.	lbs.
W. W. Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Benzine	5 gallons			
Shale Spirit	5 gallons			

No. 2.

		cwt.	qrs.	lbs.
Medium Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Benzine	5 gallons			
Shale Spirit	5 gallons			

No. 3.

		cwt.	qrs.	lbs.
Common Rosin		1	0	0
Raw Linseed Oil	½ gallon			
Benzine	5 gallons			
Shale Spirit	5 gallons			

THE SAME WITHOUT OIL.

No. 1.

		cwt.	qrs.	lbs.
W. W. Rosin		1	0	0
Benzine	5 gallons			
Shale Spirit	5 gallons			

No. 2.

		cwt.	qrs.	lbs.
Medium Rosin		1	0	0
Benzine	5 gallons			
Shale Spirit	5 gallons			

No. 3.

	cwt.	qrs.	lbs.
Common Rosin	1	0	0
Benzine .... 5 gallons			
Shale Spirit .... 5 gallons			

Rosin or *mixing varnish* is the usual trade term for the above varnishes.

PRESERVATIVE VARNISH FOR IRON WORK.

	cwt.	qrs.	lbs.
Common Rosin	0	2	0
Gutta Percha	0	0	2
Dried Sulphate of Zinc	0	0	2
Mineral Naphtha .... 8 gallons			

Sweat the rosin and gutta-percha together, then sprinkle in the sulphate of zinc, cool to 130° F., and add the naphtha.

PRESERVATIVE VARNISH FOR IRON WORK.

(Also used as a first coating for ships' bottoms, previous to the application of anti-fouling compositions.)

	cwt.	qrs.	lbs.
Common Rosin	1	0	0
Gutta Percha	0	0	8
Stearate of Zinc	0	0	8
*Mineral Naphtha .... 24 gallons			

*This may be coal tar naphtha or a mixture of this material and benzine.

STEARATE OF ZINC (USED IN ABOVE).

	cwt.	qrs.	lbs.
White Curd Soap	0	1	0
Sulphate of Zinc	0	0	8

Process.—Dissolve the sulphate of zinc and soap separately in boiling water. Mix together while boiling, dry and fuse stearate for use.

SIMPLE ROSIN VARNISHES.

These are prepared in a variety of ways and are usually the base of some further preparation, such as cheap quick-drying paint, etc. (see Chapter XV.).

Various solvents are used, as in the following :—

ROSIN NAPHTHA VARNISH.

Dissolve 1 cwt. rosin in 12 gallons naphtha. (Fusel oil and methylated spirit may be used.)

ROSIN BENZINE VARNISH.

Rosin	250	lbs.
Oxide of Manganese	7	lbs.
Benzine	35	gallons

ROSIN TURPENTINE VARNISH.

Dark Rosin	100	lbs.
Turps.	8	gallons

Put 100 lbs. dark rosin in pot, add turps. with it. Put on slow fire until all the rosin has melted; take off fire. If too stout add more turps.

BRIGHT VARNISH FOR SHIPS' USE.

	cwt.	qrs.	lbs.
Pale Rosin	1	2	0
Rosin Oil	2	1	0
Rosin Spirit	0	1	14

Process.—Sweat the rosin at 300° F. for four hours, then add the oil and continue the boiling for one hour. Take from the fire and cool down to 200° F., and carefully add the spirit, well stirring in. Rectified or crude rosin spirit according to price.

ROSIN THINNINGS.

To make varnish thinnings, put into a churn and churn for about three hours :—

Scotch Shale Naphtha	40	gallons
Rosin, Amber	400	lbs.

TURPENTINE ASPHALTUM VARNISH.

Hard Asphaltum	200	lbs.
Soft Asphaltum	200	lbs.
Linseed Oil	8	gallons
Red Lead	15	lbs.
Turps.	50	gallons
Benzine	40	gallons

TURPENTINE ASPHALTUM VARNISH.

Cheap Asphaltum	350	lbs.
Rosin	100	lbs.
Turps.	30	gallons
Benzine	25	gallons

TURPENTINE ASPHALTUM VARNISH.

Asphaltum	500	lbs.
Rosin	200	lbs.
Turps.	30	gallons
Benzine	25	gallons

TURPENTINE ASPHALTUM VARNISH.

Cuban Asphaltum	460	lbs.
Rosin	380	lbs.
Turps.	70	gallons
Benzine	65	gallons

CHAPTER X.

SPIRIT VARNISHES AND POLISHES.

We now have to describe in detail a very important and largely used class of varnishes—those, namely, in which the solvent is methylated spirit. Some details of the composition of this material were given in a previous chapter, but it is necessary to refer to it again in this place. Methylated spirit, as used for manufacturing purposes, is sold in two strengths, viz., 60 and 64 O.P. (over proof) respectively. It is the 64 O.P strength which is best for dissolving shellac and other gums used in spirit varnish making, and this corresponds to a specific gravity of ·8215 at 60° F. The sp. gr. of 60 O.P. spirit is ·8298. The excise regulations as to the use and storage of methylated spirit are stringent, and what is known as un-mineralised spirit can only be procured by duly authorised persons.

The process of spirit varnish making is a simple one, and the chief secret lies in the selection of suitable materials.

A barrel mounted on a spindle and caused to rotate by a belt and pulleys is the usual form of varnish churn in the cold process. The hot process once in vogue in France is nearly extinct.

All spirit varnishes should be aged before being sent out, and they should also be strained, and for the finer sorts filtered. Powdered lime, chalk, carbonate of magnesia or silica are used to clarify these varnishes and also to remove moisture.

Knotting.

WHITE KNOTTING.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	0	0
Venice Turps.	0	0	5
Methylated Spirit .... 25 gallons			

PATENT KNOTTING.

Gum Manilla	60	lbs.
Button Lac	60	lbs.
Pale Resin	60	lbs.
Methylated Spirit	17	gallons
Petroleum	4	gallons

PATENT KNOTTING.

Shellac	40	lbs.
Resin	20	lbs.
Methylated Spirit	10	gallons

PATENT KNOTTING.

Orange Shellac	70	lbs.
Resin	30	lbs.
Oxalic Acid	½	lb.
Methylated Spirit	25	gallons

WHITE KNOTTING.

Patent Knotting (any selected recipe)	20	gallons
White Hard Spirit Varnish	20	gallons

WHITE KNOTTING.

	cwt.	qrs.	lbs.
Dammar Gum	1	0	0
Turpentine .... 10 gallons			
Methylated Spirit .... 15 gallons			

KNOTTING.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	0
Powdered Pale Resin	0	3	0
Methylated Spirit .... 25 gallons			

KNOTTING.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	0	3	0
Powdered Pale Resin	0	3	0
Methylated Spirit .... 30 gallons			

KNOTTING.

	cwt.	qrs.	lbs.
Orange Lac	0	2	0
Powdered Button Shellac	0	2	0
Powdered Pale Resin	0	2	0
Methylated Spirit .... 30 gallons			

KNOTTING.

	cwt.	qrs.	lbs.
Orange Shellac	1	0	0
Venice Turps.	0	0	5
Methylated Spirit .... 25 gallons			

PATENT KNOTTING.

Patent Knotting as above.............	10 gallons
Brown Hard Spirit Varnish	10 gallons

CHEAP KNOTTING.

No. 1.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	0
Powdered Pale Resin	0	3	0
Methylated Spirit ...... 12½ gallons			
Rectified Naphtha ...... 12½ gallons			

No. 2.

		cwt.	qrs.	lbs.
Powdered Garnet Shellac		0	3	0
Powdered Pale Resin		0	3	0
Methylated Spirit	15 gallons			
Rectified Naphtha	15 gallons			

No. 3.

		cwt.	qrs.	lbs.
Orange Shellac		0	2	0
Powdered Button Lac		0	2	0
Powdered Pale Resin		0	2	0
Methylated Spirit	15 gallons			
Rectified Naphtha	15 gallons			

No. 4.

		cwt.	qrs.	lbs.
Orange Shellac		1	0	0
Venice Turps.		0	0	5
Methylated Spirit	12½ gallons			
Rectified Naphtha	12½ gallons			

Undoubtedly the strongest knotting is that made from good button shellac, but the latter must be really good and free from rosin, with which it is often adulterated.

The three following are excellent recipes :—

PATENT OR PALE KNOTTING.

Methylated Spirit	30	gallons
Button Shellac	105	lbs.
Product	37½	gallons

EXTRA STOUT KNOTTING.

Methylated Spirit	2	gallons
Button Shellac	12	lbs.

This is also called *Tank Varnish*, and may be used to protect the inside of petroleum tanks, etc.

PATENT KNOTTING (CHEAPER).

Methylated Spirit	34	gallons
Button Shellac	76	lbs.
Garnet Shellac	20	lbs.
Manilla Copal	16	lbs.
G. Rosin	24	lbs.
Product	43½	gallons

Hard Spirit Varnishes.

These are bright, transparent, hard varnishes, the essential gum being in the paler or white kinds, sanderac, and, in the darker, garnet shellac. Most of the white and brown hard varnishes are now bodied up with rosin.

The following recipes will yield varnishes of splendid lustre and wearing properties suitable for all classes of work.

BEST BROWN HARD VARNISH.

Methylated Spirit	20	gallons
Sanderac	56	lbs.
Garnet Shellac	42	lbs.
G. Rosin	98	lbs.

FINE BROWN HARD VARNISH.

Methylated Spirit	24	gallons
Sanderac	12	lbs.
Manilla	48	lbs.
Garnet Shellac	42	lbs.
G. Rosin	98	lbs.

In the above two recipes part of the rosin may be left out if a thinner varnish is required.

CHEAP BROWN HA

Methylated Spirit ....
Manilla ....
Sanderac ....
Rosin ....
Garnet Shellac ....

BEST WHITE HAI

Methylated Spirit ....
Sanderac ....
Pale Rosin ....

FINE WHITE HAI

Methylated Spirit ....
Manilla ....
Rosin ....

CHEAP WHITI

Gum Manilla ....
Pale Rosin ....
Methylated Spirit ....
Petroleum ....

The following are a further sel(varnishes :—

WHITE HARD SPI]

No. I

Gum Sandarac ....
Rosin ....
Methylated Spirit ....

No. 2

Sandarac ....
Pale Resin ....
Methylated Spirit ....

No. 3.

	cwt.	qrs.	lbs.
Gum Sandarac	0	2	0
Pale Resin	0	2	0
Methylated Spirit .... 20 gallons			

No. 4.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal Gum ...	1	0	0
Powdered Pale Resin	1	0	0
Methylated Spirit .... 25 gallons			

No. 5.

	cwt.	qrs.	lbs.
Powdered Spirit Copal Gum	1	0	0
Turpentine Varnish ..... 12 gallons			
Methylated Spirit .... 20 gallons			

No. 6.

	cwt.	qrs.	lbs.
Powdered Gum Sandarac	0	2	0
Powdered Dry White Shellac	0	2	0
Powdered W. W. Resin	1	0	0
Methylated Spirit .... 25 gallons			

BEST BROWN HARD SPIRIT VARNISH.

Sandarac	70	lbs.
Dark Rosin	84	lbs..
Garnet Lac	14	lbs.
Methylated Spirit	21	gallons

SANDARAC WHITE HARD VARNISH.

Sandarac	56	lbs.
Methlyated Spirit	10	gallons

Makes exactly 14 gallons.

BROWN HARD VARNISH.

Gum Sandarac	1 cwt.
Rosin	½ cwt.
Methylated Spirit	21 gallons
Pure Fast Yellow	⅛ oz.
Bismarck Brown........................	⅛ oz.

BROWN HARD SPIRIT VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	2	0
Powdered Dark Gum Sandarac	0	2	0
Venice Turps.	0	0	10
Methylated Spirit .... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Hard Dark Manilla Copal Gum	0	2	0
Powdered Common Resin	1	0	0
Methylated Spirit .... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
Powdered Gum Sandarac	1	0	0
Powdered Pale Resin.................	0	1	7
Dragon's Blood	0	0	3
Methylated Spirit .... 20 gallons			

No. 4.

	cwt.	qrs.	lbs.
Powd. Hard Dark Manilla Copal Gum	0	2	0
Powdered Common Resin	1	0	0
Bismarck Brown (Aniline)	0	0	0¼
Methylated Spirit .... 20 gallons			

No. 5.

	cwt.	qrs.	lbs.
Orange Shellac	1	0	0
Turpentine Varnish ..... 12 gallons			
Methylated Spirit .... 20 gallons			

No. 6.

	cwt.	qrs.	lbs.
Powdered Spirit Copal Gum	1	0	0
Dragon's Blood	0	0	7
Turpentine Varnish ..... 9 gallons			
Methylated Spirit .... 20 gallons			

No. 7.

	cwt.	qrs.	lbs.
Orange Shellac	1	0	0
Methylated Spirit .... 20 gallons			

No. 8.

	cwt.	qrs.	lbs.
Powdered Hard Dark Manilla Copal .	0	2	0
Powdered Common Resin	1	0	0
Crysoidine Crystals (Aniline) .. 1 oz.			
Methylated Spirit .... 20 gallons			

RED HARD SPIRIT VARNISH.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	0	1	0
Powdered Dark Manilla Copal Gum ..	0	2	0
Powdered Common Resin	1	1	0
Crysoidine Crystals (Aniline)	0	0	2
Methylated Spirit .... 30 gallons			

RED HARD SPIRIT VARNISH.

No. 2.

Knotting	1	gallon
Bismarck Brown	2	ozs.
Red Dye	$\frac{1}{4}$	oz.

NOTE.—The Manilla (also called Manila) Gum referred to in the foregoing recipes is often termed *Spirit Copal*.

Polishes.

These are among the most important of spirit varnishes, on account of their wide use in the French polishing and kindred industries. They are produced in various colours, from transparent or nearly white to black, the chief intermediate colours being brown, orange, red, and walnut.

Shellac is an invariable ingredient, and the following indicate the composition of the leading grades.

BEST WHITE FRENCH POLISH.

Methylated Spirit	14	gallons
White Shellac (after drying, reduced 25 to 30% in weight)	56	lbs.

BEST ORANGE FRENCH POLISH.

Methylated Spirit	30	gallons
Orange Shellac	45	lbs.

Bleach with a little oxalic acid in methylated spirit.

STOUT LIGHT FRENCH POLISH.

Methylated Spirit	20	gallons
T N Orange Shellac	60	lbs.

Bleach as above.

BROWN FRENCH POLISH.

Methylated Spirit	15	gallons
T N Orange Shellac	10	lbs.
Dark Shellac	10	lbs.
Gum Benzoin	20	lbs.

WALNUT FRENCH POLISH.

Add to either of the last three recipes a little walnut stain in spirit, according to shade required.

BUTTON POLISH.

Button Shellac	8	lbs.
Methylated Spirit	4	gallons
Benzoin	$\frac{1}{4}$	lb.
Sandarac	$\frac{1}{4}$	lb.

BUTTON POLISH.

Knotting	1	gallon
Methylated Spirit	1	gallon

RED FRENCH POLISH.

Methylated Spirit	11	gallons
Garnet Shellac	23	lbs.
Ground Red Sanders Wood	10	lbs.

Enclose dye in muslin bag and place in churn.

GARNET POLISH.

Methylated Spirit	20	gallons
Garnet Shellac	45	lbs.

NAPHTHA POLISH.

Wood Naphtha	5	gallons
Orange Shellac	12	lbs.

WHITE FRENCH POLISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	0	0
Powdered Gum Elemi	0	0	10
Methylated Spirit .... 50 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	2	0
Powdered Pale Manilla Copal Gum...	0	0	20
Powdered W. W. Rosin	0	0	20
Methylated Spirit .... 60 gallons			

FRENCH POLISH.

Orange Shellac	2½ lbs.
Linseed Oil	½ pint
Methylated Spirit	1 gallon

WHITE FRENCH POLISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	0	0
Methylated Spirit .... 50 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	0	0
Powdered Gum Sandarac	0	0	14
Methylated Spirit .... 50 gallons			

RED POLISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	1	0	0
Crysoidine Crystals (Aniline)	0	0	2
Methylated Spirit .... 60 gallons			
Powdered Garnet Lac	0	3	7

No. 2.

	cwt.	qrs.	lbs.
Powd. Hard Dark Manilla Copal Gum	0	0	21
Crysoidine Crystals (Aniline)	0	0	1½
Methylated Spirit .... 50 gallons			

No. 3.

	cwt.	qrs.	lbs.
Orange Shellac	1	0	0
Dragon's Blood......................	0	0	14
Methylated Spirit .... 50 gallons			

BROWN POLISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	1	0	0
Methylated Spirit .... 50 gallons			

No. 2.

	cwt.	qrs.	lbs.
Orange Shellac	1	0	0
Methylated Spirit .... 50 gallons			

FRENCH POLISH.

No. 1.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	0
Common Rosin	0	1	0
Methylated Spirit .... 50 gallons			

No. 2.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	14
Gum Elemi	0	0	14
Methylated Spirit .... 50 gallons			

No. 3.

	cwt.	qrs.	lbs.
Orange Shellac	0	2	21
Powdered Hard Manilla Copal Gum	0	0	15
Common Rosin	0	0	10
Methylated Spirit .... 50 gallons			

EBONY POLISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	1	0	0
Powdered Gum Elemi	0	0	12
Spirit Black (Aniline)	0	0	4
Methylated Spirit .... 50 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	1	0	0
Powdered Hard Manilla Copal	0	1	0
Spirit Black (Aniline)	0	0	5
Methylated Spirit .... 60 gallons			

FRENCH POLISH (SPECIALITY).

Orange Shellac	102	lbs.
Rosin	84	lbs.
Methylated Spirit	60	gallons
Auramine		
Oxalic Acid		

Also contains 3 gallons distilled or rain water.

FRENCH POLISH.

Orange Shellac	2¼ lbs.
Methylated Spirit	1 gallon
Gamboge	2 ozs.

RED POLISH.

Garnet Polish	½ gallon
Brown Hard	½ gallon
Crimson Crystals	2 ozs.

NAPHTHA FRENCH POLISH.

No. 1.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	0
Powdered Pale Rosin	0	1	0
Methylated Spirit .... 25 gallons			
Wood Naphtha .... 25 gallons			

No. 2.

	cwt.	qrs.	lbs.
Orange Shellac	0	2	0
Powdered Pale Rosin	0	2	0
Methylated Spirit .... 25 gallons			
Wood Naphtha .... 25 gallons			

COFFIN POLISH.

	cwt.	qrs.	lbs.
Powdered Manilla Copal	0	1	14
Orange Shellac	0	0	14
Powdered Pale Rosin	0	2	14
Methylated Spirit .... 15 gallons			

WHITE BRUSH POLISH.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	0	3	14
Powdered Pale Rosin	0	0	14
Powdered Manilla Copal	0	0	10
Castor Oil	0	0	1
Methylated Spirits .... 27 gallons			

BROWN BRUSH POLISH.

	cwt.	qrs.	lbs.
Orange Shellac	0	3	14
Powdered Manilla Copal	0	0	10
Powdered Pale Rosin	0	0	14
Castor Oil	0	0	1
Methylated Spirit .... 27 gallons			

BRUSH POLISH.

Garnet Polish	½ gallon
Best Brown Hard	½ gallon
Glaze	½ pint

To make up if wanted in a hurry or otherwise.

LIGHT BRUSH POLISH.

Best Brown Hard	3 gallons
French Polish (Light)	2 gallons
Glaze	3 gills

MEDIUM BRUSH POLISH.

Best Brown Hard	3 gallons
Dark French Polish	2 gallons
Glaze	3 gills

POLISH FOR BRUSH BACKS.

Garnet Lac	1½ lbs.
Gum Manilla	½ lb.
Methylated Spirit	1 gallon

PIANO POLISH.

Orange Shellac	2	lbs.
Benzoin	1	oz.
Sandarac	1	oz.
Methylated Spirit	1	gallon

PIANO POLISH.

Best Button Lac	2½	lbs.
Methylated Spirit	1	gallon

COFFIN VARNISH OR POLISH.

French Polish	1½	gallons
Best Brown Hard	1	gallon

COFFIN POLISH.

Garnet Lac	3	lbs.
Methylated Spirit	1	gallon

Glaze or Patent Glaze.

This article is used instead of French polish, and is applied with a brush instead of with a pad like true polish. Gum benzoin is a usual constituent.

The following are typical recipes :—

No. 1.

Methylated Spirit	21	gallons
Gum Benzoin	60	lbs.

No. 2.

Methylated Spirit	21	gallons
Gum Benzoin	50	lbs.
Sandarac Gum	10	lbs.

PATENT GLAZE FOR FRENCH POLISHERS.

	cwt.	qrs.	lbs.
Powdered Gum Benzoin	0	3	0
Methylated Spirit .... 15 gallons			

When dissolved, filter through filter paper and add to the following varnish when bright :—

	cwt.	qrs.	lbs.
Powdered Manilla Copal	1	2	0
Powdered Common Rosin	3	0	0
Methylated Spirit .... 64 gallons			

SPIRIT SIZE FOR FRENCH POLISHERS.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	0	2	0
Powdered Gum Sandarac	0	2	0
Methylated Spirit .... 80 gallons			

WHITE GLAZE.

	cwt.	qrs.	lbs.
Gum Benzoin	0	1	14
Methylated Spirit .... 20 gallons			

Shellac Varnishes

are of varying composition, but in general they differ from polishes in being sufficiently stout to be applied with a brush. They are used where a very hard quick drying finish is required, and for various special purposes including electrical work.

SHELLAC VARNISH.

Orange Shellac	2½ lbs.
Methylated Spirit	1 gallon
Benzoin	½ lb.

SHELLAC VARNISH.

Shellac	84	lbs.
Methylated Spirit	12	gallons
Auramine	}	to tint.
Oxalic Acid	}	

SHELLAC VARNISH.

Shellac	2½	lbs.
Methylated Spirit	1	gallon

SHELLAC VARNISH (REDUCED QUALITIES).

No. 1.

Shellac Varnish	¾ gallon
Rosin Varnish	¼ gallon

No. 2.

Shellac Varnish	½ gallon
Rosin Varnish	½ gallon

No. 3.

Shellac Varnish	¼ gallon
Rosin Varnish	¾ gallon

SHELLAC VARNISH

(AS USED BY LARGE ELECTRICAL COMPANIES).

Shellac	64	lbs.
Resin	64	lbs.
Methylated Spirit	34	gallons

Makes 45 gallons.

SHELLAC VARNISH FOR PAPER.

Shellac	35	lbs.
Methylated Spirit	10	gallons

Contains no aniline or acid.

Makes 13 gallons.

SHELLAC VARNISH FOR INSULATING.

(USED BY LARGE ELECTRICAL WORKS.)

Shellac	100	lbs.
Methylated Spirit	40	gallons

Contains no auramine or oxalic, but may contain acid brown or Bismarck brown.

EXTRA STOUT SHELLAC VARNISH FOR ABOVE.

Shellac	84	lbs.
Methylated Spirit	12	gallons

Auramine and oxalic acid.

Makes 19 gallons.

SPECIAL PALE PURE SHELLAC VARNISH.

Orange Shellac	112	lbs.
Methylated Spirit	32	gallons

Makes exactly 41⅓ gallons.

STOUT SHELLAC VARNISH FOR CASINGS OF ELECTRIC WIRES, ETC.

Methylated Spirit	21	gallons
Garnet Shellac	56	lbs.
Manilla	56	lbs.
Rosin	84	lbs.

Mt better quality, use Sandarac instead of Manilla.
Ben

SHELLAC WATER VARNISH.

(WATERPROOF, AND USED AS VEHICLE FOR WATER COLOURS, INKS, ETC.)

Pale Shellac	$2\frac{1}{2}$ lbs.
Borax	$\frac{1}{2}$ lb.

Digest in 1 gallon water at nearly boiling point till dissolved. Cool and strain.

TRANSPARENT SHELLAC VARNISH.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Sandarac	8	lbs.
Ex. Pale Rosin	12	lbs.

If wanted extra pale, mix above with equal volume of best white hard.

The following six recipes are of American origin :—

WHITE SHELLAC.

Alcohol	38	gallons
White Shellac	228	lbs.
W. G. Rosin	25	lbs.

ORANGE SHELLAC.

Shellac	175	lbs.
W. G. Rosin	30	lbs.
Alcohol	40	gallons

ORANGE SHELLAC.

Alcohol	26	gallons
S. S. Shellac	133	lbs.
W. G. Rosin	30	lbs.

ALCHOLENE SHELLAC.

Shellac	77½	lbs.
H. Rosin	10	lbs.
Benzine	2	gallons
Alcholene	152	gallons

ALCHOLENE SHELLAC.

Shellac	67	lbs.
W. G. Rosin	15	lbs.
Alcholene	14	gallons

ALCHOLENE SHELLAC.

Alcholene	30	gallons
S. S. Shellac	150	gallons
W. G. Rosin	30	gallons

Spirit Varnishes for Sundry Purposes.

SHIP'S DECK VARNISH.

Methylated Spirit	6	gallons
Garnet Shellac	9	lbs.
Manilla	3	lbs.
G. Rosin	3	lbs.
Product	2 qrs.	6 lbs.

METHYLATED SPIRIT FINISH.

(Legal requirements, 3 ozs. solid per gallon of fluid.)

Extra Pale Rosin	21¼	lbs.
O. P. Spirit 64	5	gallons
Product	6½	gallons thick varnish.

¾ gallon and 2 ozs. thick varnish added to 11¼ gallons 61 o. p. spirit yield methylated finish containing 3 ozs. rosin per gallon.

CHINESE VARNISH.

(Dries in 6 minutes.)

Methylated Spirit	1	gallon
Mastic	1	lb.
Sandarac	1	lb.

CARRIAGE VARNISH.

Methylated Spirit	3	gallons
Sandarac	5	lbs.
Pale Orange Shellac	3	lbs.
Pale Rosin	3	lbs.
Canada Balsam (added after solution)	6	lbs.

PATTERN VARNISH.

Best Brown Hard	½	gallon
French Polish	½	gallon

HARDWOOD LACQUER.

Dissolve 2 lbs. shellac in 1 gallon spirits; used for turned articles, being applied to them with a rag while in motion on lathe.

GOOD YELLOW VARNISH.

Spirits of Wine	3	pints
Sandarac	4	ozs.
Drop Lake	20	grains
Copal	2	ozs.
White India Rubber	1	oz.
Patent Yellow	22	grains

Put these in a vessel near a fire, shaking and stirring until dissolved.

ROSIN VARNISH.

Rosin	1	cwt.
Methylated Spirit	10	gallons

Makes 21 gallons.

SPIRIT COPAL VARNISH.

Methylated Spirit	1	gallon
Manilla Copal	2	lbs.
Crushed Glass or Clean Sand	2	lbs.
Camphor	¼	lb.

Heat at steam heat and decant. Strain.

CHEAP FURNITURE VARNISH.

Methylated Spirit	24	gallons
Manilla	50	lbs.
G. Rosin	70	lbs.
Common Rosin	70	lbs.
Sandarac	10	lbs.

BOX VARNISH.

(Used for cases by aerated water manufacturers.)

Methylated Spirit	21	gallons
Rosin	210	lbs.
Manilla Copal	35	lbs.

Tint with picric acid, aniline orange, etc.

PLAIN WOOD BOX VARNISH.

Satinwood Varnish Stain	9	gallons
Walnut Varnish Stain	1	pint
Oak Varnish Stain	1	pint

VARNISH FOR WICKER BASKETS.

WHITE.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	2	0
Powdered Pale Rosin	1	0	0
Methylated Spirit ...... 16 gallons			

BROWN.

	cwt.	qrs.	lbs.
Orange Shellac	0	1	0
Powdered Manilla Copal	0	1	0
Powdered Common Rosin	0	2	0
Methylated Spirit ...... 12 gallons			

LEATHER VARNISH.

BROWN.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	1	0	0
Venice Turps.	0	0	21
Bismarck Brown (Aniline)	0	0	1
Methylated Spirit ...... 30 gallons			

BLACK.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	1	0	0
Powdered Common Rosin	0	2	4
Spirit Black (Aniline)	0	0	$0\frac{1}{2}$
Castor Oil	0	0	2
Methylated Spirit .... 36 gallons			

FURNITURE LEATHER REVIVER.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	0	3	0
Gum Sandarac	0	0	21
Castor Oil	0	0	4
Methylated Spirit .... 35 gallons			

Coloured with aniline dyes to shade required.

BOOKBINDERS' VARNISH.

BROWN.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	1	0	0
Powdered Gum Elemi	0	0	8
Venice Turps.	0	1	14
Methylated Spirit ...... 48 gallons			

EBONY.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	1	0	0
Venice Turps.	0	0	21
Spirit Black (Aniline)	0	0	6
Crysoidine Crystals (Aniline)	0	0	0½
Methylated Spirit ...... 40 gallons			

BOOKBINDERS' VARNISH.

Methylated Spirit	3	gallons
Button Shellac	6	
Gum Benzoin	2	ozs.
Sandarac	2	ozs.

METAL VARNISH.

	cwt.	qrs.	lbs.
Powdered Black Manilla Copal	0	2	0
Powdered Common Rosin	0	2	0
Methylated Spirit ...... 18 gallons			

METAL VARNISH FOR STOVING AT 80° F.

	cwt.	qrs.	lbs.
Powdered Manilla Copal	0	1	7
Powdered Common Rosin	1	0	0
Methylated Spirit ...... 33 gallons			

Stained with aniline dyes to shade required.

Either of above are suitable for coating preserved meat tins, etc.

TOY VARNISHES.

WHITE.

	cwt.	qrs.	lbs.
Powdered Manilla Copal	0	2	0
Powdered Pale Rosin	0	2	0
Methylated Spirit ...... 12 gallons			

YELLOW.

	cwt.	qrs.	lbs.
Powdered White Shellac	0	1	14
Powdered Pale Rosin	0	2	0
Turmeric	0	0	4
Methylated Spirit ...... 20 gallons			

WALKING STICK VARNISH.

MALACCA.

	cwt.	qrs.	lbs.
Orange Shellac	0	2	0
Powdered Manilla Copal	0	0	25
Powdered Pale Rosin	0	0	25
Crysoidine Crystals .... 4 ozs.			
Methylated Spirit ...... 25 gallons			

SPIRIT PAPER VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	1	14
Powdered Pale Rosin	0	2	0
Methylated Spirit ...... 12 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	1	0
Powdered Pale Rosin	0	2	0
Methylated Spirit ...... 12 gallons			

PALE VARNISH FOR SHOW CARDS, ETC.

No. 1.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	2	0
Powdered W. W. Rosin	0	2	0
Methylated Spirit ...... 16 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	1	0
Powdered W. W. Rosin	0	2	0
Methylated Spirit .... 12 gallons			

PLAYING CARD VARNISH.

	cwt.	qrs.	lbs.
Gum Elemi	0	2	0
Methylated Spirit ...... 4 gallons			

CELLULOID VARNISH.

	cwt.	qrs.	lbs.
Gun Cotton	0	2	0
Ether .... 20 gallons			

When well soaked together add—

Methylated Spirit .... 30 gallons

Dissolve, and stand till clear. Draw off the clear solutio and add—

	cwt.	qrs.	lbs.
Camphor	0	1	7

Any colour desired may be made by staining with aniline:

PATENT ROLLER VARNISH.

(Used on the rollers in the largest Lancashire cotton mills.)

No. 1.

	cwt.	qrs.	lbs.
Fish Glue	0	2	0
Gelatine	0	0	7
Methylated Spirit ...... 3 gallons			
Lavender Water	0	10	$1\frac{3}{4}$

No. 2.

	cwt.	qrs.	lbs.
Fish Glue	0	2	0
Gelatine	0	0	10
Methylated Spirit ...... 3 gallons			
Naphtha .... $\frac{1}{2}$ gallon			
Lavender Water	0	0	1

No. 3.

		cwt.	qrs.	lbs.
Fish Glue		0	2	0
Gelatine		0	0	10
Methylated Spirit	1½ gallons			
Naphtha	1½ gallons			
Lavender Water		0	0	1

No. 4.

		cwt.	qrs.	lbs.
Fish Glue		0	2	0
Gelatine		0	0	10
Methylated Spirit	½ gallon			
Naphtha	1½ gallons			
Lavender Water		0	0	1

Process.—The fish glue and gelatine are dissolved in a little water, then add the spirits and lavender water, and finish by working to a cream with water.

PHOTOGRAPHERS' VARNISH.

DRY PLATE NEGATIVE VARNISH.

Camphor	1½	lbs.
Ether	1	quart
Copal	2	lbs.
Turps.	1	gallon
Methylated Spirit	1	gallon

Dissolve the camphor in the ether, add copal, add the others and decant.

NEGATIVE VARNISHES.

No. 1.

		cwt.	qrs.	lbs.
White Shellac		0	0	7
Gum Sandarac		0	0	1
Camphor	½ oz.			
Oil of Lavender	¼ oz.			
Methylated Spirits	4 gallons			

No. 2.

	cwt.	qrs.	lbs.
Gum Mastic	0	0	4
Gum Sandarac	0	0	7
Venice Turps.	0	0	2
Methylated Spirit ...... 4 gallons			

No. 3.

	cwt.	qrs.	lbs.
Gum Sandarac	0	0	1
White Shellac	0	0	16
Venice Turps.	0	0	2½
Methylated Spirit ...... 4 gallons			

VIOLIN VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Pale Manilla Copal Gum	0	1	0
Gum Elemi	0	0	7
Camphor	0	0	3
Oil of Lavender	0	0	0½
Methylated Spirit ...... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
Gum Mastic	0	0	14
Gum Sandarac	0	0	14
Coarse Powdered Glass	0	0	14
Venice Turpentine	0	0	7
Methylated Spirit ...... 10 gallons			

BREWERS' GLAZE FOR WOOD VATS.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	0	3	0
Powdered Manilla Copal	0	0	10
Powdered Common Resin	1	0	0
Venice Turps.	0	0	10
Methylated Spirit ...... 40 gallons			

BREWERS' GLAZE FOR IRON CISTERNS.

	cwt.	qrs.	lbs.
Powdered Garnet Lac.	1	2	0
Powdered Gum Sandarac	0	0	20
Venice Turps.	0	0	20
Methylated Spirit ...... 40 gallons			

Lacquers.

The majority of the spirit lacquers are tinted products and these are fully described in the next chapter. For a colourless lacquer or lacquer-base the following are recipes :—

No. 1.

White stick shellac is broken up and dried, and is then shaken up with methylated spirit, 1½ lbs. per gallon, till the spirit has dissolved all it can.

Allow to settle, and the clear portion is a fine, colourless lacquer.

No. 2.

Methylated Spirit	1	gallon
Sandarac	1	lb.
Canada Balsam	1	oz.

No. 3.

A thin white hard spirit varnish is used as a lacquer.

Black Spirit Varnishes.

BLACK LACQUER FOR LEATHER.

	lbs.	ozs.
Shellac	4	0
Venice Turps.	0	4
Gum Sandarac	0	4
Castor Oil	0	4
Aniline Spirit Black	0	4
Methylated Spirit .... 1¾ gallons		

Process.—Mix the shellac and the sandarac with 1 gallon spirit and allow to dissolve. Mix the spirit black, Venice turps.

and castor oil in a stiff paste with remainder of spirit. When both are well together add the whole and well agitate. Keep for a few days in a warm place to allow gums to thoroughly digest.

BLACK CYCLE ENAMEL.

Button Lac	30	lbs.
Dark Rosin	20	lbs.
Dark Sandarac	5	lbs.
Methylated Spirit	12	gallons
Aniline Black	2	lbs.
Crysoidine Crystals	1½	ozs.
Castor Oil	½	lb.

CYCLE BLACK.

No. 1.

	cwt.	qrs.	lbs.
Ground Button Lac	0	1	2
Gum Sandarac	0	0	10
Castor Oil	0	0	0½
Aniline Spirit Black	0	0	2
Methylated Spirit	12 gallons		

Process.—Dissolve the gums in the spirit, then add the black and castor oil, stir well and filter. Cold process.

No. 2.

	cwt.	qrs.	lbs.
Garnet Lac	0	0	12
Hard Manilla Copal	0	0	24
Common Rosin	0	0	20
Aniline Spirit Black	0	0	2
Methylated Spirit ...... 12 gallons			

Process as No. 1.

CYCLE BLACK.

Gum Sandarac	13	lbs.
Dark Resin	16	lbs.
Orange Shellac	17	lbs.
Gum Accroides	4	lbs.
Aniline Black	2	lbs.
Methylated Spirit	10	gallons

Always put the rosin in last; the aniline colours go in first.

STOVE BLACK.

Same proportions as above, but use Manilla gum instead of sandarac.

BLACK ENGINE SPIRIT VARNISH.

Garnet Shellac	150	lbs.
Methylated Spirit	50	gallons
Venice Turps.	14	lbs.
Spirit Black	4	lbs.

JET BLACK LEATHER ENAMEL FOR COACH PAINTERS, PORTMANTEAU MAKERS, ETC.

	cwt.	qrs.	lbs.
Garnet Lac	0	1	2
Venice Turps.	0	0	10
Aniline Spirit Black	0	0	1½
Methylated Spirit ...... 10 gallons			

Process as for cycle black.

CHINESE BLACK ENAMEL FOR LIGHT FANCY ARTICLES.

	cwt.	qrs.	lbs.
Garnet Lac	0	1	2
Gum Sandarac	0	0	5
Common Rosin	0	0	20
Aniline Spirit Black	0	0	1½
Methylated Spirit ...... 10 gallons			

JET BLACK CYCLE VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Powdered Garnet Shellac	1	0	0
Powdered Gum Sandarac	0	0	21
Powdered Common Rosin	0	3	0
Spirit Black (Aniline)	0	0	8
Crysoidine Crystals (Aniline)	0	0	0½
Methylated Spirit ...... 48 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	1	0	0
Powdered Gum Elemi	0	0	12
Powdered Spirit Black (Aniline)	0	0	4
Crysoidine Crystals (Aniline)	0	0	23
Methylated Spirit ...... 50 gallons			

No. 3.

	cwt.	qrs.	lbs.
Powdered Garnet Lac.	1	0	0
Powdered Nigrosine Black (Aniline)	0	0	4
Methylated Spirit ...... 50 gallons			

CHAPTER XI.

TINTED SPIRIT VARNISHES, POLISHES & LACQUERS.

There are an immense number of spirit varnishes and spirit varnish derivatives which are coloured, usually with a soluble coal-tar dye, and which are used in great variety in the arts and manufactures.

At the present moment, owing to their comparatively recent introduction, *hat polishes* command a considerable share of attention, and we are able to present our readers with the most recent and approved processes for the manufacture of these profitable specialities in all shades.

Hat Polish.

The first thing is to prepare a good stock polish, and the following are recipes used for this purpose :—

No. 1.

Methylated Spirit	17	gallons
Venice Turpentine	4	gallons
Manilla White Hard	10	gallons

No. 2.

Spirit	$5\frac{3}{4}$	gallons
Venice Turps.	12	lbs.
White Hard	$3\frac{1}{2}$	gallons

No. 3.

Gum Thus	$\frac{1}{2}$ lb.
Garnet Lac.	$1\frac{1}{2}$ lbs.
Rosin	2 lbs.
Sandarac	$1\frac{1}{2}$ lbs.
Camphor	$\frac{1}{4}$ lb.
Methylated Spirit	1 gallon

Add 2 ozs. of aniline black, blue, red, picric acid, brown, or yellow, according to desired shade.

For a second quality, add one quart of petroleum to every gallon, and omit sandarac, using Manilla instead.

A good straw hat polish dries quickly, and must not crack off when the hat is bent. The following will be found very excellent for their purpose.

It will be found best to make a stock polish to which the colour can be added as may be required.

A white stock varnish for the paler tints of colouring—

No. 4.

Gum Sandarac	$2\frac{1}{4}$ lbs.
Gum Elemi	$\frac{3}{4}$ lb.
Gum Thus	1 lb.
Calcutta Castor Oil	$\frac{1}{4}$ lb.
Methylated Spirit	$1\frac{1}{2}$ gallons

All the above gum will dissolve in the methylated spirit without heat if occasionally stirred.

A stock polish for the darker kinds can be made from cheap gums—

No. 5.

Shellac	$1\frac{1}{4}$ lbs.
Gum Manilla Copal	$\frac{1}{2}$ lb.
Gum Sandarac	$\frac{1}{2}$ lb.
Castor Oil	$1\frac{1}{4}$ ozs.
Methylated Spirit	$1\frac{1}{4}$ gallons

The following stains (aniline dyes) can be used to tint the stock varnish to the desired shade:—

BLACK.—2 ozs. Ebony Black spirit stain to 1 gallon Varnish.

MAHOGANY.—½ oz. Bismarck Brown to 1 gallon Varnish.

WALNUT.—1 oz. Bismarck Brown and ¼ oz. Nigrosine to 1 gallon Varnish.

OLIVE GREEN.—½ oz. of Brilliant Green, ½ oz. Bismarck Brown to 1 gallon Varnish.

BROWN OLIVE.—¼ oz. Brilliant Green, 1 oz. Bismarck Brown to 1 gallon Varnish.

CREAM.—Sufficient Crysoidine to tint.

GOLD YELLOW.—1 oz. Crysoidine and 1 oz. Aniline Yellow to 1 gallon Varnish.

BRIGHT GREEN.—1 oz. Brilliant Green and ⅛ oz. Aniline Yellow to 1 gallon Varnish.

BLUE.—1 oz. Spirit Blue to 1 gallon Varnish.

VIOLET.—½ oz. Methyl Violet 3 B. to 1 gallon Varnish.

MAROON.—1 oz. Saffranine and ¼ oz. Induline to 1 gallon Varnish.

HAT POLISH (SIMILAR TO HIGH-CLASS SPECIALITIES).

	cwt.	qrs.	lbs.
Gum Manilla	1	0	0
Rosin	1	0	0
Methylated Spirit .... 4 gallons			
Wood Spirit or Solvent Naphtha .... 44 gallons			
Gum Thus .... 14 lbs.			

Anilines of any colour, 2 ozs. to every gallon of spirit.

Straw Hat Polishes.

(ANOTHER METHOD).

WHITE.

	cwt.	qrs.	lbs.
Powdered Pale Manilla Copal	0	2	0
W. W. Rosin	0	2	0
Methylated Spirit .... 28 gallons			

BLACK.

	cwt.	qrs.	lbs.
Powdered Garnet Lac.	0	2	0
Powdered Common Rosin	0	2	0
Spirit Black	0	0	4
Methylated Spirit .... 28 gallons			

BROWN.

	cwt.	qrs.	lbs.
Powdered Garnet Lac	0	2	0
Powdered Common Rosin	0	2	0
Methylated Spirit .... 28 gallons			

The dyes mentioned in the following are soluble spirit dyes.

WEDGEWOOD BLUE.

White	1 gallon
Wedgewood Blue	1 to 2 ozs.

TURQUOISE BLUE.

White	1 gallon
Turquoise Blue	1 to 2 ozs.

DARK NAVY BLUE.

White	1 gallon
Dark Navy Blue	1 to 2 ozs.

VIOLET.

White	1 gallon
Violet	1 to 2 ozs.

MAUVE.

White	1 gallon
Mauve	1 to 2 ozs.

HELIOTROPE.

White	1 gallon
Heliotrope	1 to 2 ozs.

GREEN.

White	1 gallon
Spirit Green	1 to 2 ozs.

PINK.

White	1 gallon
Geranium Pink	1 to 2 ozs.

GOLD.

White	1 gallon
Gold Crystals	1 to 2 ozs.

BROWN.

Brown	1 gallon
Spirit Brown	1 to 2 ozs.

BLACK.

Methylated Spirit	5 gallons
Garnet Shellac	5 lbs.
Black Rosin	3 lbs.
Sandarac	2 lbs.
Castor Oil	1½ gills
Nigrosine	6 ozs.
Vegetable Black	3 ozs.
Soluble Indigo	½ oz.

Crush the gums and dissolve in the spirit, add the colours, first rubbing up the vegetable black with the castor oil, add. Stir, when gums are dissolved strain.

The usual style of packing for a 3d. bottle is 2 oz. panelled squares, costing, say, 4s. 6d. per gross in 50 gross lots. Ginger beer corks (4d. gross) cut in halves or three parts are used for stopping.

Straw Hat Polishes.

(VERY HARD AND DURABLE).

VIOLET.

Spirit	5	gallons
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Methyl Violet	2½	ozs.

HELIOTROPE.

Spirit	5	gallons
Bleached Shellac	5	lbs.
Pale Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Fast Acid Violet	¾	oz.

CRIMSON OR BORDEAUX RED.

Spirit	5	gallons
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Saffranine	4	ozs.

PEACOCK BLUE.

Spirit	5	gallons
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Fast Acid Blue	5	ozs.
Induline	1½	ozs.
Brilliant Green	¼	oz.

MOSS GREEN.

Spirit	5	gallons
Pale Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Brilliant Green	4½	ozs.
Chrysoidine	½	oz.

TRANSPARENT OR AMBER.

Spirit	5	gallons
Sandarac	5	lbs.
Gum Elemi	2½	lbs.
Amber Rosin	2½	lbs.
Castor Oil	1½	gills

BUTTERCUP YELLOW.

Spirit	5	gallons
Pale Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Chrysoidine	4	oz.

OLIVE GREEN.

Spirit	5	gallons
Garnet Shellac	5	lbs.
Amber Rosin	3	lbs.
Sandarac	2	lbs.
Castor Oil	1½	gills
Brilliant Green	2½	ozs.
Bismarck Brown R	1¾	ozs.

SALMON.

Spirit	5	gallons
Pale Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Saffranine	2	ozs.
Chrysoidine	½	oz.

MAIZE.

Spirit	5	gallons
Pale Rosin	5	lbs.
Sandarac	2½	lbs.
Bleached Shellac	2½	lbs.
Castor Oil	1½	gills
Chrysoidine	2	ozs.
Saffranine	½	oz.

DARK BLUE.

Spirit	5	gallons
Dark Rosin	5	lbs.
Orange Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Spirit Blue	6	ozs.
Indigo (Soluble)	4	ozs.

MAHOGANY.

Spirit	5	gallons
Orange Shellac	5	lbs.
Dark Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Bismarck Brown	2½	ozs.
Nigrosine	¼	oz.

CREAM.

Spirit	5	gallons
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Elemi	1¼	lbs.
Castor Oil	1½	gills
Chrysoidine	1	oz.

MAROON.

Spirit	5	gallons
Garnet Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Bismarck Brown	3	ozs.
Induline	¼	oz.

Straw Hat Polishes.

(NEW PROCESS).

IN NUMEROUS ART SHADES.

Although we here present a great variety of tints or shades, we are aware of the fact that a manufacturer is not called upon to put up all of those following in the usual small bottles; our wish being to help the manufacturer supplying the Luton straw

hat industry with polish in bulk to at once make up or match any shade desired.

BLACK.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Garnet Shellac	5 lbs.
Dark Rosin	3 lbs.
Gum Sandarac	2 lbs.
Castor Oil	1½ gills
Peerless Black	3 ozs.
Sulphuric Ether	1½ ozs.
Indigo (Soluble)	½ oz.
Nigrosine	6 ozs.
Acetate of Amyl	½ *dr.*

Mix the liquids, add the gums (crushed), indigo and nigrosine, and the black rubbed up with a little spirit or with the castor oil. When dissolved, strain.

No. 2.

Methylated Spirit Substitute	5 gallons
Best Black Sealing Wax	12½ lbs.
Castor Oil	1 gill
Canada Balsam	2 ozs.

Dissolve.

No. 3.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Nigrosine	6 ozs.
Vegetable Black	3 ozs.

Boil the shellac and borax in half the water, and liquefy the soap in remainder, add nigrosine and the black rubbed up with a little soap solution, and mix all together.

VIOLET.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Methyl Violet 3 B	2¾ ozs.
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Acid Violet 10 B	2½ drs.
Azo-Fuchsine G	2 drs.
Acid Violet 4 B Extra	2 drs.

As for black.

OLIVE GREEN.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Dark Rosin	3 lbs.
Sandarac	2 lbs.
Castor Oil	1½ gills
Brilliant Green	2½ ozs.
Bismarck Brown R	2 ozs.
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Yellow Extra	9 drs.
Fast Green Bluish	2½ drs.
Orange H B	½ dr.

PEACOCK BLUE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Fast Acid Blue B	5 ozs.
Induline	2¼ ozs.
Brilliant Green	¼ oz.
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Acid Blue B	4½ ozs.
Fast Light Green	1 oz.

EAU DE NIL.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Bleached Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Green Bluish	28	grains
Indian Yellow G	12	grains
Orange H B	5	grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	½	dr.
Indian Yellow G	11	grains
Lac Orange C	4	grains

DARK GREEN.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Garnet Shellac	5	lbs.
Dark Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Acid Green G G	2¼	ozs.
Naphthol Yellow S	1	oz
Fast Acid Violet 10 B	¼	oz.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Acid Green G G	2½ ozs.
Naphthol Yellow S	1¼ ozs.
Methyl Violet 3 B	¼ oz.
Lac Orange C	15 grains

HELIOTROPE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Bleached Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Acid Violet 10 B	1 dr.
Azo-Fuchsine G	1 dr.
Acid Violet 4 B Extra	42 grains

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Acid Violet 10 B	14 grains
Saffranine	14 grains
Methyl Violet 3 B	12 grains

BUTTERCUP YELLOW.

No. 1.

Benzol	2½ gallons
Acetone	2½ gallons
Fusel Oil	½ gallon
Lemon Rosin	5 lbs.
Bleached Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Chrysoidine	4 ozs.
Indian Yellow G	4 ozs.
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Indian Yellow G	1½ ozs.
Lac Orange C	½ oz.

BRIGHT GREEN.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Lemon Rosin	5 lbs.
Bleached Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Brilliant Green	4½ ozs.
Naphthol Yellow S	½ oz.
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Naphthol Yellow S	7 drs.
Fast Light Green	3 drs.

NUT BROWN.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Fast Yellow Extra	1¼ ozs.
Azo-Fuchsine	¼ oz.
Orange H B	¼ oz.
Fast Green Bluish	1 dr.
Acetate of Amyl	½ dr.
Sulphuric Ether	1½ ozs.

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Yellow Extra	1½ ozs.
Azo-Fuchsine G	¼ oz.
Orange H B	1½ drs.
Fast Green Bluish	1 dr.

CRIMSON.

No. 1.

Benzol	$2\frac{1}{4}$ gallons
Acetone	$2\frac{1}{4}$ gallons
Fusel Oil	$\frac{1}{2}$ gallon
Orange Shellac	5 lbs.
Lemon Rosin	$2\frac{1}{2}$ lbs.
Sandarac	$2\frac{1}{2}$ lbs.
Castor Oil	$1\frac{1}{2}$ gills
Sulphuric Ether	$1\frac{1}{2}$ ozs.
Acetate of Amyl	$\frac{1}{2}$ dr.
Rhodamine B	$\frac{1}{2}$ oz.
Azo-Fuchsine S	$2\frac{1}{2}$ drs.
Orange H B	14 grains

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	$2\frac{1}{2}$ lbs.
Rosin Soap	$1\frac{1}{2}$ lbs.
Rhodamine B	$\frac{1}{2}$ oz.
Azo-Fuchsine S	$2\frac{1}{2}$ drs.
Lac Orange C	14 grains

DARK BROWN.

No. 1.

Benzol	$2\frac{1}{4}$ gallons
Acetone	$2\frac{1}{4}$ gallons
Fusel Oil	$\frac{1}{2}$ gallon
Garnet Shellac	5 lbs.
Amber Rosin	$2\frac{1}{2}$ lbs.
Sandarac	$2\frac{1}{2}$ lbs.
Castor Oil	$1\frac{1}{2}$ gills
Sulphuric Ether	$1\frac{1}{2}$ ozs.
Acetate of Amyl	$\frac{1}{2}$ dr.
Fast Yellow Extra	2 ozs.
Fast Green Bluish	$2\frac{1}{4}$ drs.
Fast Red N S	$2\frac{1}{4}$ drs.
Orange H B	$1\frac{1}{2}$ drs.

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Yellow Extra	2	ozs.
Fast Green Bluish	¼	oz.
Fast Red N S	¼	oz.
Orange H B	1½	drs.

SALMON.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Azo-Fuchsine S.	2½	ozs.
Orange H. B.	½	oz.

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Azo-Fuchsine S.	2½	ozs.
Orange H.B.	½	oz.

CLARET.

No. 1.

Benzol	2½ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Azo-Fuchsine G.	1 oz.
Fast Red N.S.	¾ oz.
Azo-Acid Violet R. Extra	3 drs.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Azo-Fuchsine G.	7½ drs.
Fast Red N.S.	5 drs.
Azo-Acid Violet R. Extra	3½ drs.

DARK BLUE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Garnet Shellac	5 lbs.
Black Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Acid Violet 10 B.	2 ozs.
Fast Green Bluish	2 ozs.
Acid Violet 4 B. Extra	1¼ ozs.
Lac Orange C.	45 grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Yellow Extra	2	ozs.
Fast Green Bluish	¼	oz.
Fast Red N S	¼	oz.
Orange H B	1½	drs.

SALMON.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Amber Rosin	5	lbs.
Bleached Shellac	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Azo-Fuchsine S.	2½	ozs.
Orange H. B.	½	oz.

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Azo-Fuchsine S.	2½	ozs.
Orange H.B.	½	oz.

CLARET.

No. 1.

Benzol	2½ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Azo-Fuchsine G.	1 oz.
Fast Red N.S.	¾ oz.
Azo-Acid Violet R. Extra	3 drs.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Azo-Fuchsine G.	7½ drs.
Fast Red N.S.	5 drs.
Azo-Acid Violet R. Extra	3½ drs.

DARK BLUE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Garnet Shellac	5 lbs.
Black Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Acid Violet 10 B.	2 ozs.
Fast Green Bluish	2 ozs.
Acid Violet 4 B. Extra	1¼ ozs.
Lac Orange C.	45 grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Acid Violet 10 B.	5	drs.
Fast Green Bluish	5	drs.
Acid Violet 4 B. Extra	4	drs.
Lac Orange C.	14	grains

NAVY BLUE.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Black Rosin	5	lbs.
Garnet Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Lac Violet 6 B.	1¼	ozs.
Fast Green Bluish	¾	oz.
Lac Orange C.	15	grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Victoria Violet 5/B.	1¼	ozs.
Fast Green Bluish	1	oz.
Orange H.B.	15	grains

OXFORD BLUE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Amber Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Acid Blue R.	7½ drs.
Azo-Fuchsine S.	½ dr.

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Acid Blue B.	1 oz.
Azo-Fuchsine S.	¼ oz.

FAWN.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Bleached Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Indian Yellow G.	44 grains
Fast Green Bluish	43 grains
Azo-Fuchsine G.	½ dr.
Lac Orange C.	26 grains
Acetate of Amyl	½ dr.

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Indian Yellow G.	½	dr.
Fast Green Bluish	1	dr.
Azo-Fuchsine G.	[illegible]	[illegible]
Fast Red A.	12	[illegible]ins

DRAB.

No. 1.

Benzol	2¼	g[illegible]s
Acetone	2¼	g[illegible]s
Fusel Oil	½	g[illegible]
Amber Rosin	5	lt[illegible]
Orange Shellac	2½	lt[illegible]
Sandarac	2½	lt[illegible]
Castor Oil	1½	g[illegible]
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Green Bluish	2½	dr.
Azo-Fuchsine G.	2	drs.
Lac Orange C.	1¾	drs.
Lac Yellow A.	1¾	drs.

No. 2.

Water	5	gallons
Orange Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	2½	drs.
Azo-Fuchsine G.	2	drs.
Orange H.B.	1½	drs.
Indian Yellow G.	1½	drs.

CHESTNUT.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Amber Rosin	2½ lbs.
Gum Thus	1¼ lbs.
Sandarac	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Victoria Violet 5 B.	½ oz.
Indian Yellow G.	½ oz.
Orange H.B.	2½ drs.
Azo-Fuchsine G.	2 drs.

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Lac Violet 6 B.	½ oz.
Indian Yellow G.	½ oz.
Orange H.B.	¼ oz.
Azo-Fuchsine G.	¼ oz.

CAMBRIDGE BLUE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Bleached Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Gum Thus	1¼ lbs.
Sandarac	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Green Bluish	84 grains
Fast Acid Violet 10 B.	28 grains
Azo-Fuchsine G.	3 grains
Orange H.B.	2 grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	2	drs.
Fast Acid Violet 10 B.	42	grains
Azo-Fuchsine G.	4	grains
Orange H.B.	3	grains

PLUM.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Garnet Shellac	5	lbs.
Amber Rosin	2½	lbs.
Gum Thus	1¼	lbs.
Sandarac	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	oz.
Acetate of Amyl	½	dr.
Azo-Fuchsine G.	1	oz.
Acid Violet 4 B. Extra	1	dr.

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Azo-Fuchsine G.	1	oz.
Acid Violet 4 B. Extra	1	dr.

CERISE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Gum Thus	1¼ lbs.
Sandarac	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Azo-Fuchsine G.	¾ oz.
Fast Acid Violet 10 B.	3 drs.
Azo-Cochineal	30 grains

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Azo-Fuchsine G.	¾ oz.
Fast Acid Violet 10 B.	3 drs.
Azo-Cochineal	32 grains

MAUVE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Amber Rosin	2½ lbs.
Gum Thus	1¼ lbs.
Sandarac	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Azo-Fuchsine S.	3½ drs.
Fast Acid Violet 10 B.	¾ dr.
Orange H.B.	¾ dr.
Azo-Cochineal	25 grains

No. 2.

Water	5	gallons
Orange Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Azo-Fuchsine S.	3½	drs.
Fast Acid Violet 10 B.	¾	drs.
Orange H.B.	¾	dr.
Azo-Cochineal	½	dr.

CARDINAL.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Amber Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Azo-Cochineal	2	ozs.

CHOCOLATE.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Dark Rosin	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Azo-Fuchsine S.	2¼	ozs.
Orange H.B.	5	drs.
Fast Green Bluish	42	grains

LIGHT BROWN.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Amber Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Yellow Extra	2½	drs.
Orange H.B.	2	drs.
Fast Light Green	1	dr.
Azo-Fuchsine G.	½	dr.

GRASS GREEN.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Gum Thus	1¼	lbs.
Sandarac	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Yellow Extra	7¼	drs.
Fast Light Green	1	dr.
Orange H.B.	6	grains

BRONZE GREEN.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Garnet Shellac	5	lbs.
Amber Rosin	2½	lbs.
Gum Thus	1¼	lbs.
Sandarac	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Green Bluish	1¼	ozs.
Fast Yellow Extra	8½	drs.
Orange H.B.	100	grains
Bismarck Brown R.	22	grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	1¼	ozs.
Fast Yellow Extra	8½	drs.
Orange H.B.	1½	drs.
Azo-Fuchsine G.	20	grains

SILVER GREY.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Bleached Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Green Bluish	1	dr.
Lac Violet 6 B.	½	dr.
Azo-Fuchsine G.	20	grains
Lac Orange C.	4	grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	1	dr.
Fast Acid Violet 10 B.	½	dr.
Bismarck Brown R.	20	grains
Orange H.B.	4	grains

FRENCH GREY.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Lemon Rosin	5 lbs.
Bleached Shellac	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Green Bluish	2 drs.
Bismarck Brown R.	1 dr.
Lac Orange C.	5 grains

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Green Bluish	1½ drs.
Azo-Fuchsine G.	40 grains
Orange H.B.	5 grains

SLATE.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Garnet Shellac	5 lbs.
Black Rosin	2½ lbs.
Gum Thus	1¼ lbs.
Sandarac	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Green Bluish	1½ drs.
Bismarck Brown R.	55 grains
Lac Orange C.	18[illegible] grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Brilliant Alizarine Cyanine 3 G.	84	grains
Azo-Fuchsine G.	28	grains
Fast Yellow Extra	42	grains

DARK SLATE.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Dark Rosin	5	lbs.
Garnet Shellac	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Green Bluish	2½	drs.
Azo-Fuchsine G.	1	dr.
Orange H.B.	45	grains
Indian Yellow G.	3	grains

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	1¼	ozs.
Bismarck Brown R.	½	oz.
Lac Orange C.	3	drs.
Indian Yellow G.	5	grains

LILAC.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Bleached Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	1¼ lbs.
Gum Thus	1¼ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Azo-Fuchsine S.	105 grains
Fast Light Green	28 grains
Orange H.B.	28 grains

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Saffranine	1½ drs.
Fast Light Green	25 grains
Lac Orange C.	25 grains

LIGHT BUFF.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Indian Yellow G	20 grains
Orange H.B.	14 grains
Bismarck Brown R.	11 grains
Fast Green Bluish	9 grains

No. 2.

Water	5	gallons
Orange Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Lac Yellow A.	40	grains
Orange H.B.	28	grains
Saffranine	21	grains
Fast Green Bluish	18	grains

RUSSET.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Indian Yellow G.	2	drs.
Lac Orange C.	1½	drs.
Bismarck Brown R.	1	dr.
Fast Green Bluish	48	grains

No. 2.

Water	5	gallons
Orange Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Indian Yellow G.	1	dr.
Orange H.B.	45	grains
Saffranine	30	grains
Fast Green Bluish	25	grains

DEEP BLUE.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Dark Rosin	5	lbs.
Garnet Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Light Green	2½	ozs.
Azo-Fuchsine G.	7	drs.
Fast Acid Violet 10 B.	4	drs.
Lac Violet 6 B.	4	drs.

TRANSPARENT.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Sandarac	5	lbs.
Elemi	2½	lbs.
Lemon Rosin	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Indian Yellow G.	10	grains

PURPLE.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Dark Rosin	5	lbs.
Garnet Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Bismarck Brown R.	3½	drs.
Acid Violet 4 B. Extra	1	dr.
Azo-Cochineal	1	dr.

No. 2.

Water		5 gallons
Garnet Shellac		5 lbs.
Borax		2½ lbs.
Rosin Soap		1½ lbs.
Saffranine		3½ drs
Lac Violet 6 B.		1 dr.
Azo-Fuchsine G.		1 dr.

SAGE GREEN.

No. 1.

Benzol		2¼ gallons
Acetone		2¼ gallons
Fusel Oil		½ gallon
Garnet Shellac		5 lbs.
Dark Rosin		2½ lbs.
Gum Thus		2½ lbs.
Castor Oil		1½ gills
Sulphuric Ether		1½ ozs.
Acetate of Amyl		½ dr.
Fast Green Bluish	2 ozs.	1½ drs.
Acid Green G.G.	1 oz.	3 drs.
Fast Yellow Extra		2 drs.
Lac Orange		1½ drs.
Nigrosine		1 dr.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Green Bluish	2½ ozs.
Acid Green G.G.	2¾ ozs.
Fast Yellow Extra	½ oz.
Orange H.B.	½ oz.
Nigrosine	2 drs.

ORANGE YELLOW.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Orange Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Indian Yellow G.	2 drs.
Lac Orange C.	½ dr.

No. 2.

Water	5 gallons
Orange Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Lac Yellow A.	2 drs.
Orange H.B.	½ dr.

ORANGE RED.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Amber Rosin	5 lbs.
Orange Shellac	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Yellow Extra	2½ drs.
Orange H.B.	1¾ drs.

No. 2.

Water	5	gallons
Orange Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Yellow Extra	2½	drs.
Lac Orange C.	2	drs.

APPLE GREEN.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Bleached Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Sandarac	2½	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Fast Yellow Extra	6	drs.
Fast Light Green	20	grains

CARNATION.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Orange Shellac	5	lbs.
Amber Rosin	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Rhodamine B.	4	drs.
Bismarck Brown R.	3½	drs.
Lac Orange C.	25	grains

GREY.

Benzol	$2\frac{1}{4}$ gallons
Acetone	$2\frac{1}{4}$ gallons
Fusel Oil	$\frac{1}{2}$ gallon
Garnet Shellac	5 lbs.
Lemon Rosin	$2\frac{1}{2}$ lbs.
Sandarac	$2\frac{1}{2}$ lbs.
Castor Oil	$1\frac{1}{2}$ gills
Sulphuric Ether	$1\frac{1}{2}$ ozs.
Acetate of Amyl	$\frac{1}{2}$ dr.
Fast Light Green	64 grains
Azo-Fuchsine G.	42 grains
Lac Orange C.	16 grains

PEA GREEN.

Benzol	$2\frac{1}{4}$ gallons
Acetone	$2\frac{1}{4}$ gallons
Fusel Oil	$\frac{1}{2}$ gallon
Lemon Rosin	5 lbs.
Bleached Shellac	$2\frac{1}{2}$ lbs.
Gum Thus	$1\frac{1}{4}$ lbs.
Sandarac	$1\frac{1}{4}$ lbs.
Castor Oil	$1\frac{1}{2}$ gills
Sulphuric Ether	$1\frac{1}{2}$ ozs.
Acetate of Amyl	$\frac{1}{2}$ dr.
Fast Light Green	70 grains
Lac Yellow A.	40 grains
Orange H.B.	5 grains

CORAL.

No. 1.

Benzol	$2\frac{1}{4}$ gallons
Acetone	$2\frac{1}{4}$ gallons
Fusel Oil	$\frac{1}{2}$ gallon
Bleached Shellac	5 lbs.
Amber Rosin	$2\frac{1}{2}$ lbs.
Sandarac	$2\frac{1}{2}$ lbs.
Castor Oil	$1\frac{1}{2}$ gills
Sulphuric Ether	$1\frac{1}{2}$ ozs.
Acetate of Amyl	$\frac{1}{2}$ dr.
Azo-Fuchsine G.	$\frac{1}{2}$ dr.
Orange H.B.	11 grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Saffranine	1	dr.
Lac Orange C.	43	grains

MYRTLE GREEN.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Dark Rosin	5	lbs.
Garnet Shellac	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Quinoline Yellow ... 2 ozs.	1½	drs.
Brilliant Alizarine Cyanine 3 G.	3½	drs.
Fast Light Green	½	dr.

No. 2.

Water	5	gallons
Garnet Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Quinoline Yellow	4½	ozs.
Nigrosine	7	drs.
Fast Light Green	35	grains

MAROON.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Dark Rosin	5 lbs.
Garnet Shellac	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Red N.S.	2¼ ozs.
Bismarck Brown R.	2¼ ozs.
Brilliant Alizarine Cyanine 3 G.	2½ drs.

No. 2.

Water	5 gallons
Garnet Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Fast Red N.S.	9 drs.
Azo-Fuchsine S.	9 drs.
Brilliant Alizarine Cyanine 3 G.	1¼ drs.

SEA GREEN.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Bleached Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Fast Green Bluish	25 grains
Fast Yellow Extra	4 grains
Orange H.B.	5 grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Fast Green Bluish	45	grains
Lac Orange C.	10	grains
Fast Yellow Extra	8	grains

LAVENDER.

No. 1.

Benzol	2¼	gallons
Acetone	2¼	gallons
Fusel Oil	½	gallon
Bleached Shellac	5	lbs.
Lemon Rosin	2½	lbs.
Sandarac	1¼	lbs.
Gum Thus	1¼	lbs.
Castor Oil	1½	gills
Sulphuric Ether	1½	ozs.
Acetate of Amyl	½	dr.
Azo-Fuchsine G.	38	grains
Fast Light Green	21	grains
Orange H.B.	5	grains

No. 2.

Water	5	gallons
Bleached Shellac	5	lbs.
Borax	2½	lbs.
Rosin Soap	1½	lbs.
Bismarck Brown R.	77	grains
Fast Light Green	42	grains
Lac Orange C.	10	grains

PINK.

No. 1.

Benzol	2¼ gallons
Acetone	2¼ gallons
Fusel Oil	½ gallon
Bleached Shellac	5 lbs.
Lemon Rosin	2½ lbs.
Sandarac	2½ lbs.
Castor Oil	1½ gills
Sulphuric Ether	1½ ozs.
Acetate of Amyl	½ dr.
Saffranine	28 grains
Lac Orange C.	14 grains

No. 2.

Water	5 gallons
Bleached Shellac	5 lbs.
Borax	2½ lbs.
Rosin Soap	1½ lbs.
Bismarck Brown R.	21 grains
Orange H.B.	11 grains

The usual bottles for a 3d. size are 2 ozs. panelled squares, costing 4s. to 4s. 6d. per gross; these should be capped to correspond with colour of contents. No. 3 caps are 6d., No. 4, 8d. gross. Capping sticks are also necessary, and cost 1s. dozen.

Leather Reviver.

Gum Thus	½ lb.
Button Lac	1½ lbs.
Rosin	3½ lbs.
Camphor	¼ lb.
Methylated Spirit	1 gallon

Aniline colour to gallon, 2 ozs. Generally done in maroon, black, red, violet.

Varnish Stains.

These exceedingly useful and saleable articles are usually prepared by tinting a suitable spirit varnish with various soluble aniline dyes (walnut, oak, mahogany, etc.). The varnish is usually of the nature of a brown hard for the darker shades and white hard for the lighter shades. The dyes can be procured under the names Spirit Walnut, Spirit Oak, etc., from any dye manufacturer.

WALNUT.

Benzoin	1	lb.
Manilla	144	lbs.
Rosin	20	lbs.
Methylated Spirit	25	lbs.
Solvent Naphtha (Wood)	2	gallons
Fusel Oil	½	gallon
Bismarck Brown	15	ozs.
Aniline Black	7	ozs.
Castor Oil	½	lb.

The castor oil gives elasticity.

OAK.

Benzoin	1	lb.
Manilla	144	lbs.
Rosin	20	lbs.
Methylated Spirit	16	gallons
Solvent Naphtha (Wood)	2	gallons
Fusel Oil	½	gallon
Yellow Aniline	10	ozs.
Black Aniline	3	ozs.
Castor Oil	½	lb.

EBONY.

Manilla	160 lbs.
Rosin	20 lbs.
Castor Oil	¾ lb.
Methylated Spirit	25 gallons
Wood Spirit	2 gallons
Benzoin	1 lb.
Aniline Black	3 lbs.
Fusel Oil	½ gallon

ROSEWOOD.

Blend—

Mahogany	3 gallons
Walnut	1 gallon

or to above gums and spirit use 3 lbs. rosewood stain.

MAHOGANY.

Manilla	160 lbs.
Rosin	24 lbs.
Castor Oil	¾ lb.
Methylated Spirit	25 gallons
Wood Spirit	2 gallons
Benzoin	1 lb.
Bismarck Brown	2 lbs.
Black Aniline	¼ lb.
Fusel Oil	½ gallon

VARNISH STAINS.

(ANOTHER METHOD).

VARNISH BASE.

NO. 1.

	cwt.	qrs.	lbs.
Powdered Manilla Copal	0	2	0
Powdered Common Rosin	1	0	0
Methylated Spirit .... 18 gallons			

No. 2.

		cwt.	qrs.	lbs.
Spirit Copal		0	3	0
Turpentine Varnish	6 gallons			
Methylated Spirit	18 gallons			

No. 3.

		cwt.	qrs.	lbs.
Powdered Manilla Copal		0	2	0
Powdered Common Rosin		0	2	0
Methylated Spirit	12 gallons			

SATINWOOD, PINE, AND MAPLE.

Spirit Satinwood Extra .....2 to 4 ozs. to gallon of Varnish

ROSEWOOD.

Spirit Rosewood P. ... 2 ozs. to gallon of Varnish
or Spirit Rosewood R.S. 2 ozs. to gallon of Varnish

MAHOGANY.

Spirit Mahogany ..... 3 ozs. to gallon of Varnish

OAK.

Spirit Oak .... 3 ozs. to gallon of Varnish

WALNUT.

Spirit Walnut .... 3 ozs. to gallon of Varnish

EBONY.

Spirit Black .... 3 ozs. to gallon of Varnish

NEW GREEN.

Spirit Sage Green .... 3 ozs. to gallon of Varnish

VARNISH STAINS.

(ANOTHER METHOD).

OAK.

Manilla Gum	84	lbs.
Dark Rosin	84	lbs.
Yellow Aniline	9	ozs.
Bismarck Brown	7	ozs.
Aniline Black	3	ozs.
Methylated Spirit	17	gallons
Petroleum	4	gallons

WALNUT.

Leave out dyes in above and add—

Bismarck Brown	14	ozs.
Japan Black Aniline	6	ozs.

MAHOGANY.

Bismarck Brown	2	lbs.
Black Aniline	1	oz.

SATINWOOD.

Yellow Aniline	9	ozs.

EBONY.

Black Aniline	4	lbs.

ROSEWOOD.

Mahogany	3	gallons
Walnut	1	gallon

VARNISH STAINS (NEW PROCESS).

MAHOGANY.

No. 1.

Methylated Spirit	5	gallons
Orange Shellac	10	lbs.
Amber Rosin	5	lbs.
Spirit Mahogany	8	ozs.

No. 2.

Benzol 90 %	2¼	gallons	
Acetone	2¼	gallons	
Amylic Alcohol	½	gallon	
Spirit Brown	4	ozs.	
Spirit Red C.	4	ozs.	
Garnet Shellac	10	lbs.	
Rosin	5	lbs.	
Sulphuric Ether	1½	ozs.	mix
Valerianate of Amyl	½	dr.	first

Mix all the liquids, add the colour, and dissolve the crushed gums therein, and strain.

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	¾	gallon
Turps.	¾	gallon
Benzol	½	gallon
Rosin	10	lbs.
Shellac	2½	lbs.
Elemi	2½	lbs.
Spirit Brown	4	ozs.
Spirit Red C.	4	ozs.

Run down gums, add petroleum and linoleate, withdraw heat, add benzol, turps., and colour; rest for one day and draw off. This might be described as an oil polish; it is also elastic.

WALNUT.

No. 1.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Dark Rosin	7	lbs.
Spirit Walnut	8	ozs.

No. 2.

Benzol	2¼	gallons	
Acetone	2¼	gallons	
Amylic Alcohol	½	gallon	
Garnet Shellac	8	lbs.	
Dark Rosin	7	lbs.	
Vandyke Brown	8	ozs.	
Spirit Brown Extra	2	ozs.	
Sulphuric Ether	1½	ozs.	} mix
Valerianate of Amyl	½	oz.	} mix

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	¾	gallon
Turps.	¾	gallon.
Benzol	½	gallon
Dark Rosin	10	lbs.
Garnet Shellac	2½	lbs.
Elemi	2½	lbs.
Vandyke Brown	7	ozs.
Spanish Brown	3	ozs.
Spirit Brown Extra	2	ozs.

SATINWOOD.

No. 1.

Methylated Spirit	5	gallons
Bleached Shellac	7	lbs.
Amber Rosin	5	lbs.

No. 2.

Benzol	2¼ gallons	
Acetone	2¼ gallons	
Amylic Alcohol	½ gallon.	
Bleached Shellac	7 lbs.	
Amber Rosin	5 lbs.	
Elemi	3 lbs.	
Sulphuric Ether	1½ ozs.	mix
Valerianate of Amyl	½ dr.	

No. 3.

Petroleum	3 gallons
Linoleate of Manganese	¾ gallon
Turps.	¾ gallon
Benzol	½ gallon
Lemon Rosin	10 lbs.
Bleached Shellac	2½ lbs.
Elemi	2½ lbs.

MAPLE.

No. 1.

Methylated Spirit	5 gallons
Orange Shellac	12 lbs.
Amber Rosin	5 lbs.

No. 2.

Benzol	2¼ gallons	
Acetone	2¼ gallons	
Amylic Alcohol	½ gallon	
Orange Shellac	10 lbs.	
Amber Rosin	5 lbs.	
Elemi	2 lbs.	
Sulphuric Ether	1½ ozs.	mix
Valerianate of Amyl	½ dr.	

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	¾	gallon
Turps.	¾	gallon
Benzol	½	gallon
Orange Shellac	10	lbs.
Amber Rosin	5	lbs.
Elemi	2	lbs.

EBONY.

No. 1.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Dark Rosin	7	lbs.
Spirit Ebony	10	ozs.

No. 2.

Benzol	2¼	gallons	
Acetone	2¼	gallons	
Amylic Alcohol	½	gallon	
Garnet Shellac	8	lbs.	
Elemi	5	lbs.	
Black Rosin	2	lbs.	
Spirit Ebony	8	ozs.	
Peerless Black	3	ozs.	
Sulphuric Ether	1½	ozs.	mix
Valerianate of Amyl	½	dr.	mix

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	¾	gallon
Turps.	¾	gallon
Benzol	½	gallon
Black Rosin	10	lbs.
Garnet Shellac	2½	lbs.
Elemi	2½	lbs.
Vegetable Black	1¼	lbs.

OAK.

No. 1.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Dark Rosin	7	lbs.
Spirit Oak	8	ozs.

No. 2.

Benzol	2¼	gallons	
Acetone	2¼	gallons	
Amylic Alcohol	½	gallon	
Garnet Shellac	8	lbs.	
Black Rosin	7	lbs.	
Spirit Oak	8	ozs.	
Sulphuric Ether	1½	ozs.	mix
Lac Yellow A.	1	oz.	mix
Lac Orange C.	½	oz.	mix
Valerianate of Amyl	½	dr.	mix

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	¾	gallon
Turps.	¾	gallon
Benzol	½	gallon
Black Rosin	10	lbs.
Garnet Shellac	2½	lbs.
Elemi	2½	lbs.
Spirit Yellow D.	2	ozs.
Spirit Orange I.	2	ozs.
Spirit Brown Extra	2	ozs.

ROSEWOOD.

No. 1.

ethylated Spirit	5	gallons
arnet Shellac	10	lbs.
emon Rosin	5	lbs.
ismarck Brown	4	ozs.
pirit Walnut	4	ozs.

No. 2.

enzol	2¼	gallons	
cetone	2¼	gallons	
mylic Alcohol	½	gallon	
arnet Shellac	5	lbs.	
'range Shellac	5	lbs.	
emon Rosin	5	lbs.	
ismarck Brown	6	ozs.	
pirit Walnut	1	oz.	
pirit Brown Extra	1	oz.	
ulphuric Ether	1½	ozs.	} mix
'alerianate of Amyl	½	dr.	} mix

No. 3.

etroleum	3	gallons
inoleate of Manganese	¾	gallons
urps.	¾	gallon
enzol	½	gallon
emon Rosin	10	lbs.
'range Shellac	2½	lbs.
lemi	2½	lbs.
pirit Red C.	4	ozs.
pirit Brown Extra	2	ozs.

CHERRY.

No. 1.

Methylated Spirit	5	gallons
Lemon Rosin	7	lbs.
Garnet Shellac	4	lbs.
Orange Shellac	4	lbs.
Spirit Cherry	8	lbs.

No. 2.

Benzol	$2\frac{1}{4}$	gallons	
Acetone	$2\frac{1}{4}$	gallons	
Amylic Alcohol	$\frac{1}{2}$	gallon	
Orange Shellac	8	lbs.	
Lemon Rosin	5	lbs.	
Elemi	2	lbs.	
Fat Red A.	2	ozs.	
Spirit Cherry	6	ozs.	
Sulphuric Ether	$1\frac{1}{2}$	ozs.	mix
Valerianate of Amyl	$\frac{1}{2}$	dr.	mix

No. 3.

Petroleum	3	gallons
Linoleate of Manganese	$\frac{3}{4}$	gallon
Turps.	$\frac{3}{4}$	gallon
Benzol	$\frac{1}{2}$	gallon
Lemon Rosin	10	lbs.
Orange Shellac	$2\frac{1}{2}$	lbs.
Elemi	$2\frac{1}{2}$	lbs.
Spirit Red C.	6	ozs.
Fat Red A.	2	ozs.

HELIOTROPE.

No. 1.

Methylated Spirit	5	gallons
Orange Shellac	8	lbs.
Dark Rosin	7	lbs.
Fast Acid Violet 10 B.	1	dr.
Acid Violet 4 B. Extra	1	dr.
Azo-Fuchsine G.	42	grains

No. 2.

Benzol	$2\frac{1}{4}$ gallons	
Acetone	$2\frac{1}{4}$ gallons	
Amylic Alcohol	$\frac{1}{2}$ gallon	
Orange Shellac	5 lbs.	
Dark Rosin	5 lbs.	
Elemi	5 lbs.	
Sulphuric Ether	$1\frac{1}{2}$ ozs.	mix
Valerianate of Amyl	$\frac{1}{2}$ dr.	
Fast Acid Violet 10 B	$\frac{3}{4}$ oz.	
Azo-Fuchsine G	$\frac{3}{4}$ oz.	
Acid Violet 4 B. Extra	$\frac{1}{2}$ oz.	
Lac Violet B.	$\frac{1}{4}$ oz.	

No. 3.

Petroleum	3 gallons
Linoleate of Manganese	$\frac{3}{4}$ gallon
Turps.	$\frac{3}{4}$ gallon
Benzol	$\frac{1}{2}$ gallon
Lemon Rosin	10 lbs.
Orange Shellac	$2\frac{1}{2}$ lbs.
Elemi	$2\frac{1}{2}$ lbs.
Methyl Violet 3 B.	$1\frac{1}{4}$ ozs.
Lac Violet 6 B.	$\frac{1}{2}$ oz.

VERDANT GREEN.

Methylated Spirit	5 gallons
Orange Shellac	8 lbs.
Lemon Rosin	5 lbs.
Elemi	2 lbs.
Naphthole Yellow S.	$2\frac{1}{2}$ ozs.
Fast Light Green	1 oz.

DARK GREEN.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Dark Rosin	7	lbs.
Acid Green G.G.	3½	ozs.
Naphthole Yellow S.	1¾	ozs.
Fast Acid Violet 10 B.	½	oz.
Orange H.B.	½	dr.

VIOLET.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Black Rosin	5	lbs.
Elemi	2	lbs.
Fast Acid Violet 10 B.	2¼	ozs.
Azo-Fuchsine G.	1¾	ozs.
Acid Violet 4 B. Extra	1¾	ozs.

OLIVE GREEN.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Black Rosin	4	lbs.
Elemi	3	lbs.
Fast Yellow Extra	3	ozs.
Fast Green Bluish	5½	drs.
Orange H.B.	70	grains

BRONZE GREEN.

Methylated Spirit	5	gallons
Garnet Shellac	8	lbs.
Black Rosin	7	lbs.
Fast Yellow Extra	2½	ozs.
Fast Green Bluish	1	oz.
Orange H.B.	80	grains
Azo-Fuchsine	40	grains

CANARY.

Methylated Spirit	5	gallons
Bleached Shellac	8	lbs.
Lemon Rosin	4	lbs.
Elemi	3	lbs.
Indian Yellow G.	3	ozs.
Lac Orange C.	½	oz.

OXFORD BLUE.

Methylated Spirit	5	gallons
Orange Shellac	8	lbs.
Lemon Rosin	4	lbs.
Elemi	3	lbs.
Fast Acid Blue B.	4	ozs.
Azo-Fuchsine S.	1½	drs.

EAU DE NIL.

Methylated Spirit	5	gallons
Bleached Shellac	8	lbs.
Elemi	4	lbs.
Lemon Rosin	3	lbs.
Fast Green Bluish	30	grains
Indian Yellow G.	12	grains
Lac Orange C.	5	grains

BUFF.

Methylated Spirit	5	gallons
Orange Shellac	10	lbs.
Amber Rosin	2½	lbs.
Elemi	2½	lbs.
Indian Yellow G.	1½	drs.
Lac Orange C.	1	dr.
Azo-Fuchsine G.	1	dr.
Fast Green Bluish	¾	dr.

Lacquers.

SHELLAC LIQUORS.

No. 1.

	cwt.	qrs.	lbs.
Lemon Shellac	0	1	0
Methylated Spirit ...... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	1	0
Methylated Spirit ...... 20 gallons			

TURMERIC LIQUOR.

	cwt.	qrs.	lbs.
Turmeric	0	0	10
Methylated Spirit .... 20 gallons			

GAMBOGE LIQUOR.

	cwt.	qrs.	lbs.
Gamboge	0	0	10
Methylated Spirit ...... 20 gallons			

DRAGONS' BLOOD LIQUOR.

	cwt.	qrs.	lbs.
Dragons' Blood	0	0	4
Methylated Spirit ...... 20 gallons			

RED WOOD LIQUOR.

	cwt.	qrs.	lbs.
Red Wood	0	0	14
Methylated Spirit ...... 20 gallons			

SILVER LACQUER.

	cwt.	qrs.	lbs.
Powdered Dried White Shellac	0	0	21
Methylated Spirit ...... 20 gallons			

PALE GOLD.

Shellac Liquor	5	gallons
Gamboge Liquor	1	gallon

FRENCH GOLD.

Shellac Liquor	3½	gallons
Turmeric Liquor	3	gallons
Dragons' Blood Liquor	¼	gallon

DEEP GOLD

Shellac Liquor	5	gallons
Dragons' Blood Liquor	2	gallons
Turmeric Liquor	1	gallon

BLUE.

	Shellac Liquor	4	gallons
Mixed	Chinese Blue	¼	lb
	Methylated Spirit	1	gallon

ROSE.

Shellac Liquor	3	gallons
Red Wood Liquor	1	gallon

RED.

Shellac Liquor	1	gallon
Dragons' Blood Liquor	½	gallon
Red Wood Liquor	½	gallon

GREEN.

Shellac Liquor	4	gallons
Turmeric Liquor	2½	gallons
Red Wood Liquor	½	gallon

SINGLE MIXTURE LACQUER.

PALE GOLD.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	2	0
Powdered Gamboge	0	0	21
Methylated Spirit ...... 35 gallons			

DEEP GOLD.

	cwt.	qrs.	lbs.
Powdered Button Lac...............	0	2	0
Powdered Gamboge	0	0	21
Powdered Dragons' Blood	0	0	3½
Methylated Spirit ...... 35 gallons			

PALE BRASS.

	cwt.	qrs.	lbs.
Powdered Best Dried White Shellac..	0	1	14
Powdered Gamboge	0	0	3½
Aloes	0	0	7
Fusel Oil .... 7 gallons			
Methylated Spirit ...... 50 gallons			

BRONZE.

	cwt.	qrs.	lbs
Powdered Button Lac	0	1	14
Powdered Gum Sandarac	0	0	21
Gum Accroides	0	0	21
Gamboge	0	0	21
Aloes	0	0	7
Methylated Spirit ...... 75 gallons			

RED.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	2	0
Venice Turps.	0	0	14
Dragons' Blood	0	0	14
Methylated Spirit ...... 50 gallons			

GREEN.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	2	0
Venice Turps.	0	0	14
Turmeric	0	0	14
Methylated Spirit ...... 50 gallons			

BRONZE LACQUER.

Best Brown Hard	3	quarts
Methylated Spirit	5	quarts
Aniline Black	2	ozs.
Bismarck Brown	1	oz.

BLUE LACQUER.

Best Brown Hard	3	quarts
Methylated Spirit	5	quarts
Blue Aniline	2	ozs.

BLACK LACQUER (SPECIALITÉ).

Shellac	20	lbs.
Rosin	120	lbs.
Wood Spirit at 9d. per gallon	24	gallons
Ether	½	gallon
Fusel Oil	¼	gallon
Methylated Spirit	4	gallons
Aniline Black	1½	lbs.
Sandarac	2	lbs.

All the lacquers are made the same way.

LACQUERS FOR STAINING WITH ANILINE DYES.

No. 1.

	cwt.	qrs.	lbs.
Powdered White Shellac	0	1	0
Methylated Spirit ...... 20 gallons			

No. 2.

	cwt.	qrs.	lbs.
Powdered White Shellac	0	0	21
Powdered Pale Rosin	0	0	14
Methylated Spirit ...... 20 gallons			

No. 3.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	1	0
Methylated Spirit ...... 20 gallons			

No. 4.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	0	14
Powdered Gum Sandarac	0	0	14
Methylated Spirit ...... 20 gallons			

No. 5.

	cwt.	qrs.	lbs.
Powdered Button Lac	0	0	14
Powdered Gum Sandarac	0	0	7
Powdered Pale Rosin	0	0	7
Methylated Spirit ...... 20 gallons			

No. 6.

	cwt.	qrs.	lbs.
Manilla Copal Gum	0	2	0
Powdered Pale Rosin	0	2	0
Methylated Spirits ...... 20 gallons			

Extra stout, suitable for toy varnishes.

Aniline dyes soluble in methylated spirits are used to stain any of above to shade.

The anilines, though not so permanent as the previous colouring matters given, form a useful range, and have the advantage of greater variety. May be considered as permanent under ordinary circumstances, but are likely to fade when exposed to direct sunlight.

LACQUER FOR METAL ARTICLES.

BLACK.

	lbs.	ozs.
Shellac	4	0
Gum Sandarac	2	0
Elemi Copal	1	0
Castor Oil	0	1
Aniline Spirit Black	0	6
Methylated Spirit ... 3 gallons		

For coloured lacquers leave out black and add as under :—

For Green Lacquer, Green Aniline ...... 6 ozs.
For Scarlet Lacquer, Spirit Aurine ...... 4 ozs.
For Violet Lacquer, Spirit Violet ...... 6 ozs.
For Magenta Lacquer, Magenta Crystals 6 ozs.

or, in fact, any aniline colour, but it must be a spirit aniline, and not soluble in water. The workings for all coloured lacquers are the same as given for the black, but substituting the colours for the spirit black.

For large quantities, a revolving barrel churn is very convenient. A $1\frac{1}{2}$-inch iron spindle is put through each end of the barrel and through holes in uprights, and barrel then revolves by turning handle. Lid to put in gum and spirit secured by set screws.

LACQUER FOR COLOURING IRON OR STEEL A DEAD BLACK.

Bismuth Chloride	1	part
Mercury Bichloride	2	parts
Copper Chloride	1	part
Hydrochloric Acid	6	parts
Alcohol	5	parts
Water	50	parts

To be well mixed.

The iron or steel to be thoroughly cleaned. The liquid is allowed to dry on the metal, and is then placed in boiling water for half an hour at 212° F. It is then covered with oil and heated until dry.

To turn brass a deep brown or copper, the staining known as red-brown should be used. To 1 pint of water add 16 drachms

hyposulphite of soda and 16 drachms nitrate of iron. If merely a dark brown, use a solution of 1 pint of water to 4 drachms nitric acid. If dark brown, approaching to black, use solution of 1 pint of water to 5 drachms nitrate of iron.

JAPANESE TRANSPARENT LAC VARNISH.

	cwt.	qrs.	lbs.
Finest Mastic Gum	0	0	2
Camphor	0	0	1
Venice Turpentine	0	0	1½
Turpentine .... 2 gallons			
Methylated Spirit ...... 8 gallon			

	cwt.	qrs.	lbs.
Copal Gum	0	1	2
Camphor	0	0	2
Oil of Lavender .... 3 gallons			
Turpentine .... 15 gallons			

SOAP LACQUERS.

Soap lacquer remains entirely unchanged in water, and has a considerable degree of elasticity. The following is the simplest method of preparing it: Good tallow soap is boiled in rain-water so that a clear solution is formed, and this is filtered through several close cloths while it is still hot. The solution is then again heated and diluted with an equal volume of rain-water. Then a boiling hot solution of alum is added to it as long as a precipitate of sebate of aluminium is formed. This precipitate is allowed to settle, the fluid standing over it is poured off, and the precipitate is then washed several times with boiling water, dried, and heated in a pot standing in a vessel filled with boiling water until it becomes transparent. Oil of turpentine is then heated in a pot to nearly boiling point, and a sufficient quantity of the aluminium soap is added to form a solution of the consistency of thick varnish. Should this prove too viscid when it has become cold, it can easily be reduced by adding a little hot oil of turpentine. Articles which have been coated with this should be placed near a hot stove, so that they will dry quickly. Coatings of this lacquer do not show a great deal of lustre, but are very durable and cheap.

PART III.

VARNISH DERIVATIVES.

CHAPTER XII.

ENAMELS.

In this and the three following chapters are discussed the numerous and important materials whose base is some sort of varnish. The present chapter treats of enamels. These substances have, during the last few years, increased in popularity to a surprising extent, not only for household and domestic use, but among high-class painters and decorators; it therefore behoves manufacturers to become cognisant of the latest advances in this department of the paint and varnish industry.

Enamels consist essentially of two parts: (1) the pigment (2) the fluid in which the pigment is suspended. First as regards the pigment or colour. White zinc oxide is the base of nearly all the enamels of normal composition, while for the tinted enamels, good quality staining colours are used. For bright reds, one of the excellent permanent reds now on the market should be used in preference to vermilion, as the latter not only blackens with age, but readily sinks when thinned out. The pigment must be ground very finely either in oil, varnish, or turps. (or spirit), according to the particular enamel it is desired to make, and is then thinned with a suitable varnish.

As regards the fluid part of the enamel (chiefly varnish), its exact composition will depend on the kind of enamel it is desired to produce. Turpentine dammar varnish is principally used for thinning enamels, but other materials are also employed.

For very tough wearing enamel, pale copal varnish should be used with the dammar varnish.

For slow drying elastic enamels, linseed oil is added.

For a smooth-flowing enamel, which will take a high polish, a little tallow or non-drying oil along with the varnish will have a good effect.

Ordinary white enamel usually contains about 4 lbs. zinc oxide per gallon, and, in coloured varieties, about 6 lbs. per gallon.

A gallon of white enamel weighs 14 to 17 lbs.

The following is a typical mixing :—

WHITE ENAMEL, ORDINARY.

Zinc Oxide	7	lbs.
Ultra. Blue	¼	oz.
Varnish (Copal)	1½	gallons
Dammar Varnish	1	gallon
French Oil Varnish	½	gallon

Many of the thinned enamels on the market consist simply of ordinary stiff paints thinned with hard oak varnish. For cheap lines for domestic use and oil-shop trade, excellent enamels may be prepared in this way, though they will not last like the more carefully prepared articles.

Well ground colours in raw linseed oil should be used, and, if possible, whiting and not barytes should be used to adulterate. A best or second quality hard oak varnish may be used for all except the palest colours.

Enamel Varnishes.

The following are varnishes suitable for enamel making.

FINE MIXING VARNISH.

Best Kauri Gum	20	lbs.
Best Copal Gum	10	lbs.
Hot Baltic Linseed Oil (350°–400° F.)	5	gallons
Turps.	10	gallons
Driers (Terebine)	1½	gallons

Process as for carriage varnishes.

MIXING VARNISH.

No. 1.

Kauri Gum	60	lbs.
Hot Linseed Oil (350°–400° F.)	5½	gallons
Turps.	15	gallons
Driers (Terebine)	1½	gallons

No. 2.

Manilla Chips	60	lbs.
Hot Linseed Oil (350°–400° F.)	5	gallons
Turps.	13	gallons
Driers (Terebine)	1	gallon

No. 3.

Resin.................................	112	lbs.
Hot Linseed Oil (350°–400° F.)	½	gallon
Benzine	4	gallons
Shale Spirit	2	gallons

Melt the gum and add the hot oil, well stirring it in. Then cool to 180° F. (outside) and add the spirit mixed together.

TRANSPARENT ENAMEL VARNISH.

30 lbs. very pale Manilla Gum must be run as clear as possible (great heat is required for this); then add, while on the fire, 2 gallons Baltic linseed oil at 400° F. and work well in; then add 1 gallon more of linseed oil. Take off the fire and beat the heat out until clear, cool to 250° F., and add 7 gallons turps.

White Enamels.

BEST QUALITY.

For the Varnish—

Gum Dammar	56	lbs.
Turps.	8	gallons

Churn together cold and let stand to clear. Take—

Pure Zinc White	6	lbs.
Varnish as above	1	gallon

Grind together and thin to consistency with varnish as above.

No. 2.

For the Varnish A—

Gum Dammar	24	lbs.
Turps.	6	gallons

Churn together cold. Take—

Zinc White Ground in Refined Linseed Oil	16	lbs.
Varnish A as above	2	gallons

Grind together and thin to consistency with varnish A.

To dry hard, take—

Zinc White	28	lbs.
Varnish A as above	2	gallons

Grind together and thin to consistency with varnish A, then add to every gallon mixed as above best pale oak varnish, half-pint.

No. 3.

For the Varnish A—

Gum Dammar	56	lbs.
W. W. Resin	6	lbs.
Turps.	10	gallons

Churn together cold.

For Varnish B—

Pale Resin	56	lbs.
Turps.	4	gallons

Sweat the resin for about six hours at 350° F., cool to 250° F., and gradually thin with the turps.

Take—

Zinc White	16	lbs.
Varnish A as above	2	gallons
Varnish B as above	2	gallons

Grind together and thin to consistency with varnish A or B, or mixed according to price required.

No. 4.

For the Varnish A—

Gum Dammar	36	lbs.
Turps.	6	gallons

For Varnish B—

FRENCH OIL VARNISH.

Gum Kauri	100	lbs.
Gum Copal	10	lbs.
Linseed Oil	50	gallons
Turps.	100	gallons
Terebene	5	gallons

Grind zinc white in varnish A, and thin to consistency with—

Varnish A	3	parts
Varnish B	1	part

CHEAPEST WHITE ENAMELS.

No. 1.

A.

W. W. Rosin	56	lbs.
Raw Linseed Oil	¼	gallon

Sweat for about four hours, cool to about 150° F., and thin with—

Benzine	2	gallons
Shale Spirit	1	gallon

B.

Gum Dammar	56	lbs.
Benzine	6	gallons
Shale Spirit	3	gallons

Dissolve cold.

C.

Gum Dammar	56	lbs.
Turps.	9	gallons

Process.—B and C churned together cold; mix the whole together, and add 2 cwts. 1 qr. zinc white ground in refined linseed oil, or with C varnish as above. Now thin with either B or C varnish as above, according to quality required, or it can be thinned with turpentine only, or—

Turpentine	3	parts
Benzine	2	parts
Shale Spirit	1	part

Now to every gallon of the thinned enamel add half-pint of hard oak varnish.

No. 2.

Gum Dammar	112	lbs.
W. W. Rosin	28	lbs.
Turps.	12	gallons
Benzine	9	gallons
Zinc White	5	cwts

Ground in refined linseed oil.

Process.—Powder the gums and rosin, and churn together cold; then grind in the zinc white, and thin with the varnish to consistency required.

No. 3.

W. W. Rosin	56	lbs.
Raw Linseed Oil	½	gallon

Sweat together, then cool, and add—

Zinc White	84	lbs.

ground with No. C varnish as above. Thin with—

Turps.	6	gallons
Benzine	4	gallons
Shale Spirit	2	gallons

To make by entirely cold process, the rosin must be ground or powdered, and churned together with the spirit.

COLD PROCESS ENAMEL.

No. 1.

Dammar	4	parts
Turpentine	26 to 28	parts

Churn together until dissolved.

No. 2.

Boiled Linseed Oil	2	parts
Colour	7	parts

Process.—Grind together; then grind Nos. 1 and 2 together through roller mills.

Enamels Made With Copal Varnish.

The copal varnish used must be a genuine copal, warranted free from resin and soft gums, which will not stand great heat, but soften, thereby gathering dust, and so being spoilt.

WHITE.

		cwt.	qrs.	lbs.
Zinc White		1	0	0
Copal Varnish	1½ gallons			
Special Oil	12 gallons			
Turpentine	1½ gallons			

GREY.

		cwt.	qrs.	lbs.
Grey Zinc Oxide		1	0	0
Copal Varnish	6 gallons			
Special Oil	6 gallons			
Turpentine	1½ gallons			

YELLOW.

		cwt.	qrs.	lbs.
Pure Naples Yellow		1	0	0
Copal Varnish	5 gallons			
Special Oil	5 gallons			
Turpentine	1½ gallons			

The special oil referred to above should either be carefully refined and racked linseed oil or pale boiled oil containing a minimum of sugar of lead or borate of manganese drier.

Tinted Enamels.

The varnish being the same in every case, the following indicate how various shades may be obtained :—

WHITE.

No. 1.

		cwt.	qrs.	lbs.
Zinc White		0	2	0
Ultramarine Blue	1 oz.			

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
Whiting	0	0	14
China Clay	0	0	14
Ultramarine Blue ... 2 ozs.			

SKY BLUE.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Chinese Blue	0	0	1

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
Whiting	0	0	14
China Clay	0	0	14
Chinese Blue	0	0	1

ROYAL BLUE.

No. 1.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	1	0
Whiting	0	0	14
China Clay	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Ultramarine Blue	0	0	14
Whiting	0	0	14
China Clay	0	0	14

PRIMROSE.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
No. 1 Lemon Chrome	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
Whiting	0	0	14
China Clay	0	0	14
No. 2 Lemon Chrome	0	2	0

LEMON CHROME.

No. 1.

Use No. 1 Lemon Chrome.

No. 2.

Use No. 2 Lemon Chrome.

MIDDLE CHROME.

No. 1.

Use No. 1 Middle Chrome.

No. 2.

Use No. 2 Middle Chrome.

ORANGE CHROME.

No. 1.

Use No. 1 Orange Chrome.

No. 2.

Use No. 2 Orange Chrome.

CANARY YELLOW.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Chrome	0	1	14
Zinc White	0	0	14

No. 2.

	cwt.	qrs.	lbs.
No. 2 Middle Chrome	0	0	14
Whiting	0	0	7
China Clay	0	0	7

STRAW COLOUR.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
No. 1 Middle Chrome	0	0	5

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
No. 2 Middle Chrome	0	0	5

CREAM COLOUR.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
No. 1 Middle Chrome	0	0	2

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
No. 2 Middle Chrome	0	0	2

CRIMSON.

No. 1.

	cwt.	qrs.	lbs.
Crimson Lake	0	1	0
Vermilionette	0	0	14
Indian Red	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Crimson Lake	0	0	14
Vermilionette	0	0	7
Indian Red	0	0	7
Whiting	0	0	14
China Clay	0	0	14

VERMILION TINT.

No. 1.

	cwt.	qrs.	lbs.
Vermilionette	0	2	0
No. 1 Lemon Chrome	0	0	4

No. 2.

	cwt.	qrs.	lbs.
Vermilionette	0	2	0
No. 1 Lemon Chrome	0	0	4
Whiting	0	0	14
China Clay	0	0	14

POST OFFICE RED.

No. 1.

USE MIDDLE ROYAL RED.

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	0	2	0
Whiting	0	0	14
China Clay	0	0	14

SIGNAL RED.

No. 1.

	cwt.	qrs.	lbs.
Middle Royal Red	0	1	14
Bright Red Oxide	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	0	1	14
Bright Red Oxide	0	0	14
Whiting	0	0	7
China Clay	0	0	7

DARK RED.

No. 1.

	cwt.	qrs.	lbs.
Middle Royal Red	0	1	0
Middle Indian Red	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	0	1	0
Middle Indian Red	0	1	0
Whiting	0	0	7
China Clay	0	0	7

MAROON.

No. 1.

	cwt.	qrs.	lbs.
Middle Indian Red	0	1	0
Burnt Turkey Umber	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Middle Indian Red	0	1	0
Burnt Turkey Umber	0	1	0
Whiting	0	0	7
China Clay	0	0	7

TERRA COTTA.

No. 1.

	cwt.	qrs.	lbs.
Middle Indian Red	0	2	0
English Ochre	0	2	0
English Umber	0	0	2

No. 2.

	cwt.	qrs.	lbs.
Middle Indian Red	0	0	14
English Ochre	0	1	0
English Umber	0	0	1
Whiting	0	0	14
China Clay	0	0	14

CERISE.

No. 1.

	cwt.	qrs.	lbs.
Middle Royal Red	0	2	14
Zinc White	0	0	21

No. 2.

	cwt.	qrs.	lbs.
Middle Royal Red	0	1	0
Whiting	0	0	14
China Clay	0	0	14

SALMON PINK.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Middle Royal Red	0	0	3
No. 1 Lemon Chrome	0	0	0½

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
Middle Royal Red	0	0	3
No. 2 Lemon Chrome	0	0	0½

ROSE TINT.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Middle Royal Red	0	0	2

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
Middle Royal Red	0	0	2

CHOCOLATE.

No. 1.

	cwt.	qrs.	lbs.
Middle Indian Red	0	2	0
Lamp Black	0	0	3

No. 2.

	cwt.	qrs.	lbs.
Middle Indian Red	0	1	0
Lamp Black	0	0	1½
Whiting	0	0	7
China Clay	0	0	7

MAHOGANY.

No. 1.

	cwt.	qrs.	lbs.
Middle Indian Red	0	1	14
French Ochre	0	0	21

No. 2.

	cwt.	qrs.	lbs.
Middle Indian Red	0	1	0
French Ochre	0	0	14
Whiting	0	0	7
China Clay	0	0	7

LIGHT GREEN.

No. 1.

Use No. 1 Light Brunswick Green.

No. 2.

Use No. 2 Light Brunswick Green.

MIDDLE GREEN.

No. 1.

Use No. 1 Middle Brunswick Green.

No. 2.

Use No. 2 Middle Brunswick Green.

DARK GREEN.

No. 1.

Use No. 1 Dark Brunswick Green.

No. 2.

Use No. 2 Dark Brunswick Green.

EMERALD GREEN.

No. 1.

Use No. 1 Emerald Green.

No. 2.

Use No. 2 Emerald Green.

APPLE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Brunswick Green	0	1	0
No. 2 Lemon Chrome	0	1	0

No. 2.

	cwt.	qrs.	lbs.
No. 1 Middle Brunswick Green	0	1	0
No. 2 Lemon Chrome	0	1	0
Whiting	0	0	14
China Clay	0	0	14

OLIVE GREEN.

No. 1.

	cwt.	qrs.	lbs.
No. 1 Middle Brunswick Green	0	2	0
Lamp Black	0	0	1

No. 2.

	cwt.	qrs.	lbs.
No. 1 Middle Brunswick Green	0	2	0
Lamp Black	0	0	1
Whiting	0	0	14
China Clay	0	0	14

ELECTRIC GREEN.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	0	21
No. 1 Deep Emerald Tint Brunswick Green	0	1	14

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	0	14
China Clay	0	0	14
No. 2 Deep Emerald Tint Brunswick Green	0	2	0

SEA GREEN.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Chinese Blue	0	0	1
No. 1 Lemon Chrome	0	0	3

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
Chinese Blue	0	0	1
No. 2 Lemon Chrome	0	0	4

EARLY GREEN.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
No. 1 Deep Emerald Tint Brunswick Green	0	1	0

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	0	14
China Clay	0	0	14
No. 2 Deep Emerald Tint Brunswick Green	0	1	0

FAWN.

No. 1.

	cwt.	qrs.	lbs
Zinc White	0	2	0
Middle Indian Red	0	0	1
English Ochre	0	0	4
English Umber	0	0	4
Vermilionette	0	0	1

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	14
China Clay	0	1	14
Middle Indian Red	0	0	1
English Ochre	0	0	4
English Umber	0	0	4
Vermilionette	0	0	1

LIGHT OAK.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	1	14
English Ochre	0	0	14
English Umber	0	0	14

No. 2.

	cwt.	qrs.	lbs.
Whiting	0	1	0
China Clay	0	1	0
English Ochre	0	0	14
English Umber	0	0	14

DARK OAK.

No. 1.

Use Burnt English Umber.

No. 2.

	cwt.	qrs.	lbs.
Burnt English Umber	0	1	14
Whiting	0	0	7
China Clay	0	0	7

BLACK.

No. 1.

	cwt.	qrs.	lbs.
Lamp Black	0	2	0
Carbon Black	0	0	2

No. 2.

	cwt.	qrs.	lbs.
Lamp Black	0	1	0
Mineral Black	0	1	0
Carbon Black	0	0	2

FRENCH GREY.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Lamp Black	0	0	1
Venetian Red	0	0	0½

No 2.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
Whiting	0	0	14
China Clay	0	0	14
Lamp Black	0	0	1
Venetian Red	0	0	0½

SILVER GREY.

No. 1.

	cwt.	qrs.	lbs.
Zinc White	0	2	0
Lamp Black	0	0	1
Ultramarine Blue	0	0	1

No. 2.

	cwt.	qrs.	lbs.
Zinc White	0	1	0
Whiting	0	0	14
China Clay	0	0	14
Lamp Black	0	0	1
Ultramarine Blue	0	0	1

Tinted Enamels.

(ANOTHER SERIES).

We now give several series of enamel formulæ, the chief variation being in the nature of the thinnings used. It has been considered better to give each series complete by itself rather than to collect the various shades and colours in groups.

SERIES I.

The thinnings chiefly Dammar and Oak Varnish.

WHITE.

*Zinc White	4	lbs.
Blue	$\frac{1}{8}$	oz.
Varnish	1	gallon

Makes 1 gallon $\frac{3}{4}$ pint.

*For white base of these enamels see p. 348.

CREAM.

Zinc White	6	lbs.
Hard Oak	1	gallon
Paper Varnish	½	gallon
*Old Gold	¼	pint

*This is ochre ground very finely in oil and thinned with dammar varnish.

IVORY WHITE.

Zinc White	6	lbs.
Hard Oak Varnish	1	gallon
Paper Varnish	½	gallon

STONE.

Zinc White	4	lbs.
Varnish	1	gallon
Old Gold	½	pint

ROYAL BLUE.

Ultramarine	2	lbs.
Varnish	1	gallon

Makes 1 gallon ½ pint.

BUFF.

Zinc White	4	lbs.
Varnish	1	gallon
Old Gold	1	pint

ROYAL BLUE.

Ultramarine	4	lbs.
Varnish	1	gallon

AZURE.

White	½ gallon
Blue	½ gallon

SERPENT.

White	3 gallons
Blue	1 gallon
Black	½ gallon

MAIDEN'S BLUSH.

Zinc White	4 lbs.
Varnish	1 gallon
*Vermilionette	¼ pint

*The quality of this will vary according to grade of enamel. *Permanent red is better.*

DEEP CORAL.

Zinc White	4 lbs.
Varnish	1 gallon
Vermilionette	1 quart

SALMON.

White	1 gallon
Vermilionette	½ gallon

DARK INDIAN RED.

Varnish	1 gallon
Dark Indian Red	3 lbs.

FLESH COLOUR.

Zinc White	4 lbs.
Varnish	1 gallon
Vermilionette	⅛ pint

PALE CORAL.

Zinc White	4	lbs.
Varnish	1	gallon
Vermilionette	½	pint

ROSE.

Zinc White	4	lbs.
Varnish	1	gallon
Vermilionette	1	pint

VERMILIONETTE.

Varnish	1	gallon
Vermilionette	12	lbs.

VERMILION TINT.

Varnish	1	gallon
Vermilionette	6	lbs.

POPPY RED.

Vermilion Tint	1	gallon
Rose Pink	1	pint

BLACK.

Hard Oak	3	gallons
Paper Varnish	1½	gallons
Terebine	½	gallon
Carbon Black	1¼	lbs.

MALACHITE.

Blue	½	gallon
M. Chrome	½	gallon

ORANGE.

Varnish	1	gallon
Orange Chrome	4	lbs.

CARDINAL.

Rose Pink	4	lbs.
Varnish	1	gallon

CANARY.

Varnish	1	gallon
Lemon Chrome	4	lbs.

LIGHT GOBELIN.

Zinc White	4	lbs.
Varnish	1	gallon
Ultra. Blue	1	pint
Chrome	3	pints

DARK GOBELIN.

White and Chrome ....each	1	pint
Blue	1	quart

BUTTERCUP.

Varnish	1	gallon
M. Chrome	4	lbs.

TURQUOISE.

White	1	gallon
Prussian Blue	1	pint

SPARROW'S EGG.

White	1	gallon
Lemon Chrome	1	pint
Prussian Blue	1	pint

LILAC.

White	1 gallon
Ultra. Blue	1 pint
Rose Pink	1 pint

SILVER GREY.

White	2 gallons
Ultra. Blue	¼ pint
Black	¼ pint

EMERALD GREEN.

White	½ gallon
Green	½ gallon

LAVENDER.

White	3 gallons
Blue	1 quart
Black	1 pint

LIGHT HELIOTROPE.

White	1 gallon
Ultra. Blue	½ pint
Rose Pink	½ pint

DARK HELIOTROPE.

White	1½ gallons
Prussian Blue	1 quart
Rose Pink	3 quarts

FRENCH GREY.

White	2 gallons
Black	½ pint
Blue	½ pint

TERRA COTTA.

Bright Red	3	lbs.

CERISE.

Rose Pink	1	gallon
White	2	gallons

MAHOGANY.

Varnish	1	gallon
Burnt Sienna	3	lbs.

PRIMROSE.

Lemon Chrome	1	gallon
White	2	gallons

The varnish used for the above enamels is a mixture of 1 gallon hard oak varnish and ½ gallon paper varnish.

All colours ground in half the amount of varnish through steel mills and the remainder of varnish added after grinding.

The white zinc base used in the above is prepared as under :

WHITE.

No. 1.

2 cwt. zinc white mixed with 5 gallons extra pale oil copal varnish in pug mill and ground four times through rollers, then add 25 gallons extra pale oil copal varnish and 1 gallon turps.

No. 2.

Zinc Oxide	1	cwt.
New White, Charlton White, or Lithopone	1	cwt.

Mixed with 5 gallons linseed oil and ground four times. Add 25 gallons varnish—

Dammar Varnish	1	part
Dark Oak Varnish	2	parts

SERIES II.

Thinnings consist of linseed oil and varnish.

DEEP PURPLE BROWN.

Vermilionette	½	lb.
Indian Red	10	lbs.
Ultra. Blue	4	lbs.
Venetian Red	2	lbs.
Raw Oil	2	pints
Dammar Varnish	12	gallons

DARK BLUE.

White	10	lbs.
Prussian Blue	6	lbs.
Raw Oil	1	pint
Dammar Varnish	9	gallons

GOLDEN YELLOW.

White	4	lbs.
Yellow Ochre	¼	lb.
Lemon Chrome	½	lb.
Orange Chrome	¼	lb.
Refined Oil	1	pint
Varnish	6	gallons

BRONZE ENAMEL.

Vermilionette	½	lb.
White	6	lbs.
Indian Red	2	lbs.
Lemon Chrome	2	lbs.
Prussian Blue	1	oz.
Refined Oil	2	pints
Dammar Varnish	9	gallons

ROUGE.

Rose Pink	12	lbs.
Vermilionette	10	lbs.
Zinc Oxide	2	lbs.
Raw Oil	3	pints
Dammar Varnish	6	gallons

FRENCH GREY.

White	12	lbs.
Ultra. Blue	1¼	lbs.
Vermilionette	2½	ozs.
Lemon Chrome	3	ozs.
Raw Oil	3	pints
Dammar Varnish	11	gallons

LILAC.

White	15	lbs.
Prussian Blue	1	oz.
Rose Pink	2½	lbs.
Vermilionette	1¼	lbs.
Refined Oil	2	pints
Dammar Varnish	9	gallons

OLIVE GREEN.

White	7	lbs.
Rose Pink	2½	lbs.
Lemon Chrome	4	lbs.
Prussian Blue	2	ozs.
Raw Oil	2	pints
Dammar Varnish	11	gallons

STRAW.

White	14	lbs.
Lemon Chrome	4	lbs.
Raw Sienna	1	oz.
Raw Oil	3½	pints
Dammar Varnish	14	gallons

SERIES III.

Miscellaneous recipes containing many useful tints and art shades.

IMPERIAL RED ENAMEL.

Vermilionette	10	lbs.
Venetian Red	6	ozs.
Zinc Oxide	1½	lbs.
Light Chrome	1	lb.
Rose Pink	1¾	lbs.
Varnish	1½	gallons

MIDDLE TERRA COTTA ENAMEL.

Zinc Oxide	6	lbs.
Venetian Red	3	lbs.
Raw Sienna	2	lbs.
Raw Oil	¼	pint
Varnish	1½	gallons

LIGHT YELLOW ENAMEL.

Zinc Oxide	15	lbs.
Light Chrome	6	lbs.
Raw Oil	½	pint
Varnish	2	gallons

DARK BLUE.

Zinc Oxide	10	lbs.
Prussian Blue	6	lbs.
Raw Oil	½	pint
Varnish	1½	gallons.

GOLDEN YELLOW.

Zinc Oxide	4	lbs.
Ochre	¼	lb.
Light Chrome	½	lb.
Orange Chrome	¼	lb.
Light Chrome	2	ozs.
Raw Oil	1	pint
Varnish	1½	gallons

MAUVE.

Zinc Oxide	7	lbs.
Vermilion	1½	lbs.
Ultra. Blue	2¼	lbs.
R. O. and Varnish ....as required		

DARK BROWN.

Burnt Umber	7	lbs.
Light Chrome	2	lbs.
Raw Umber	½	lb.

SCARLET ENAMEL.

Vermilion	14	lbs.
Zinc Oxide	3	lbs.
Venetian Red	3	lbs.

ROUGE.

Rose Pink	12	lbs.
Vermilion	10	lbs.
Zinc Oxide	2	lbs.

BRONZE ENAMEL.

Vermilion	½	lb.
Zinc Oxide	6	lbs.
Indian Red	2	lbs.
Lemon Chrome	2	lbs.
Prussian Blue	1	oz.

FRENCH GREY.

Zinc Oxide	12	lbs.
Ultra. Blue	1¼	lbs.
Vermilion	2½	ozs.
Light Chrome	3	ozs.

LILAC.

Zinc Oxide	15	lbs.
Prussian Blue	1	oz.
Rose Pink	2½	lbs.
Vermilion	1¼	lbs.

OLIVE GREEN.

Zinc Oxide	7	lbs.
Rose Pink	2½	lbs.
Lemon Chrome	4	lbs.
Prussian Blue	2	ozs.

STRAW.

Zinc Oxide	14	lbs.
Light Chrome	4	ozs.
Raw Sienna	1	oz.

GRASS GREEN.

Zinc Oxide	7	lbs.
Light Chrome	4	lbs.
Prussian Blue	1	oz.

PRIMROSE.

Zinc Oxide	14	lbs.
Light Chrome	1	lb.

OLD GOLD.

Zinc Oxide	7	lbs.
Burnt Sienna	1½	lbs.
Lemon Chrome	4	lbs.

CITRON GREEN.

Zinc Oxide	4	lbs
Raw Sienna	3	lbs
Burnt Sienna	¾	lb.
Lemon Chrome	4	lbs
Prussian Blue	2	ozs

MOSS GREEN.

Zinc Oxide	12	lbs.
Light Brunswick Green	3	lbs.
Lemon Chrome	1	lb.
Rose Pink	¾	lb.

CRIMSON.

Vermilion	6 lbs.
Zinc Oxide	1 lb.

VERMILION.

Vermilion	10 lbs.
Zinc Oxide	3½ lbs.
Venetian Red	6 ozs.
Lemon Chrome	8 ozs.

PEARL GREY.

Zinc Oxide	16 lbs.
Carbon Black	¼ oz.
Lemon Chrome	½ oz.

PEACOCK GREEN.

Zinc Oxide	8 lbs.
Peacock Blue	¼ lb.
Lemon Chrome	¾ lb.
Raw Oil	¼ pint
Varnish	1½ gallons

IVORY.

Zinc Oxide	14 lbs.
Raw Sienna	½ oz.

CREAM.

Zinc Oxide	14 lbs.
Raw Sienna	1½ ozs.
Chrome	1 oz.

SILVER GREY.

Zinc Oxide	14	lbs.
Ultra. Blue	2	ozs.
Black, a little.		

CANARY.

Light Chrome	4	lbs.
Zinc Oxide	12	lbs.

ORANGE.

Zinc Oxide	15	lbs.
Orange Chrome	7½	lbs.
L. Chrome	3¾	lbs.
Raw Oil	½	pint
Varnish	5	gallons

MAROON.

Indian Red	5	lbs.
Rose Pink	5	lbs.

ELECTRIC BLUE.

Zinc Oxide	16	lbs.
Prussian Blue	¾	oz.

VIOLET ENAMEL.

Zinc Oxide	12	lbs.
Rose Pink	6	lbs.
Prussian Blue	½	lb.
Vermilion	1¼	lbs.

FLESH COLOUR.

Zinc Oxide	12	lbs.
Vermilion	1½	ozs.
Lemon Chrome	3	ozs.
Orange Chrome	3	ozs.

SAGE GREEN.

Zinc Oxide	10	lbs.
Yellow Ochre	3½	lbs.
Celestial Blue	2½	lbs.
Vegetable Black	¼	oz.
Chrome	¼	lb.
Raw Oil	¼	pint
Varnish	1¾	gallons

PEACOCK GREEN.

Zinc Oxide	16	lbs.
Prussian Blue	½	lb.
L. Chrome	1½	lbs.

CORAL.

Zinc Oxide	12	lbs.
Vermilion	2	lbs.
L. Chrome	4	ozs.
Venetian Red	8	ozs.

CARDINAL.

Vermilion	16	lbs.
Zinc Oxide	3½	ozs.
Venetian Red	6	ozs.
Lemon Chrome	8	ozs.
Rose Pink	1¼	lbs.

CHOCOLATE.

Indian Red	6	lbs.
Ochre	8	lbs.
L. Chrome	4	lbs.
Carbon Black	6	ozs.

FAWN.

Zinc Oxide	8½	lbs.
Raw Sienna	3½	lbs.
Lemon Chrome	½	lb.

Special Enamels for Safes, Ironwork, Machinery, etc.

LIGHT CHOCOLATE.

	cwt.	qrs.	lbs
White Lead	0	1	12
Zinc Oxide	0	2	14
Raw Sienna	0	0	20
Lemon Chrome	0	0	7½

Venetian Red	1¾	ozs.
Ultra. Blue	1¾	ozs.
Oak Varnish	16	gallons
Raw Oil	2	gallons

Slow-drying.

DARK BRUNSWICK GREEN (DEAD SURFACE).

Dark Brunswick Green	5	lbs.
China Clay	1	lb.
Dark Terebine	6	pints
Gold Size	2	pints

WHITE ENAMEL FOR MACHINERY.

Zinc White	14 lbs.
Ultra. Blue	½ oz.
Raw Oil	1½ pints
Dammar Varnish	2¾ gallons

GREY COACH COLOUR FOR MACHINERY.

Zinc Oxide	30 lbs.
Vegetable Black	½ lb.
Prussian Blue	½ lb.
Thinnings (as above)	4 gallons

WINE COLOUR ENAMEL FOR SAFES.

Rose Pink	3½ lbs.
Vermilionette	1½ lbs.
Gold Size and Turps. ....each	½ pint

SPECIAL VERMILION FOR MACHINERY.

Vermilionette	6 ozs.
Best Venetian Red	¼ oz.
Lemon Chrome	¼ oz.
Zinc Oxide	1 oz.
Boiled Oil Varnish........................	1 quart

AZURE BLUE ENAMEL FOR MACHINERY.

Zinc Oxide	3½ ozs.
Ultra. Blue	1½ ozs.
Prussian Blue, a little	
Boiled Oil and Varnish	1 pint

STOVING ENAMEL.

Zinc White	54	lbs.
Ultra. Blue	2	ozs.
Raw Oil	1	gallon
Flatting Varnish	4	gallons

Thin with 10 gallons flatting varnish.

SPECIAL BROWN ENAMEL FOR TINS.

	cwt.	qrs.	lbs.
Raw Umber	1	0	0
Ochre	0	2	0
Indian Red	0	0	4
Barytes	0	0	10
Driers	0	0	14

Gold Size	2	gallons
Boiled Oil	3	gallons
Raw Oil	3	gallons

Thinned with 16 gallons mixing varnish.

SPECIAL WHITE ENAMEL FOR TABLETS.

Zinc Oxide	9	lbs.
Raw Oil	1	pint
Silver Stoving Varnish	1	gallon

Grind together. Thin with $2\frac{1}{2}$ gallons of stoving varnish.

Black Enamels.

No. 1.

Brunswick Black	4	gallons
Turps.	2	gallons
Vegetable Black	2	gallons

Ground together through conical mill.

No. 2.

Carbon Black	1	gallon
Crystal Varnish	2	gallons

Ground and thinned with dammar varnish to consistency.

No. 3.

Carbon Black	2	gallons
Drop Ivory Black	1	gallon

Ground with $1\frac{1}{2}$ gallons gold size; $1\frac{1}{2}$ gallons oak varnish. Thinned with oak varnish.

No. 4.

Carbon Black	2	gallons
Ground in—		
Oak Varnish	3	gallons
Linseed Oil	2	gallons

Thinned with quick drying oil varnish.

No. 5.

CHEAP BLACK ENAMEL.

Good black paint thinned with the cheap mixing varnish.

No. 6.

Vegetable Black	1	lb.
Carbon Black	1	lb.
Ground in—		
Gold Size	2	gallons
Then thinned with—		
Gold Size	2	gallons
Dammar Varnish	1	gallon
Turps.	2	gallons

No. 7.

Drop ivory black ground in quick drying Manilla varnish, and thinned with the same.

BLACK ENAMEL.

Carbon Black	3½	lbs.
Brunswick Black	1	gallon
Paper Varnish	8	gallons

SPIRIT BLACK ENAMEL.

Shellac	60	lbs.
Sandarac	20	lbs.
Castor Oil	¾	lb.
Methylated Spirit	25	gallons
Gum Benzoin	2	lbs.
Vegetable Black	5	lbs.
Aniline Black	1½	lbs.
Fusel Oil	½	gallon

For other spirit blacks see Chapter X.

Sundry Special Enamels.

HARD PALISADING ENAMEL (HOT PROCESS).

To be used as white facing (cover first coat with ordinary enamel).

Flake White or Pure Oxide of Zinc	7¾	lbs.
Copal Varnish (Best and Hardest Copal Gum)	3	quarts
Oil Paper Varnish	1	quart

(56 lbs. dammar, melt in 6 gallons linseed oil at 350/400° F., cool to 250° F., and thin with 8 gallons turps.)

HARD DRYING DAMMAR ENAMEL (COLD PROCESS).

Dissolve cold.—4 lbs. gum dammar in 1 gallon turps., and mix with zinc white ground in refined linseed oil (about 8 lbs.).

To dry harder.—Mix the zinc white ground with the varnish (about 14 lbs. to the gallon varnish), and thin with the varnish, and add ½ pint oak varnish to the gallon of this.

BATH ENAMEL.

Take, say, 14 lbs. genuine zinc oxide, and thin down with ½ crystal varnish and ½ Japan pale gold size. Use any colour to tint.

TRANSPARENT ENAMEL FOR BATHS, &C.

30 lbs. pale Manilla gum (clear as possible), melt by heat (great heat is required for this). Add, while on the fire, 2 gallons hot Baltic linseed oil at 400° F. and work well in, then add 1 gallon more linseed oil. Take off the fire and beat the heat out until clear; cool down, and add 7 gallons turps.

Take 8 lbs. best zinc white ground in crystal paper varnish to each gallon of the above. (For crystal varnish, 4 lbs. dammar dissolved in 1 gallon turps. cold.)

ENAMELS FOR BRICK WALLS.

Water White Resin	112	lbs.

Sweat four hours at 240° F., cool to 150° F., and add—

Zinc White	168	lbs.
Mineral Naphtha	16	gallons
Benzoline	8	gallons

Add ½ pint hard oak varnish to each gallon of the above.

No. 2.

W. W. Resin	112	lbs.
Raw Linseed Oil	¾	gallon

(Sweat together as above.)

Zinc White ground in Refined Linseed Oil	168	lbs.

(Takes about 2 gallons oil to the cwt. zinc white.)

Mineral Naphtha No. 2	8	gallons
Benzine	16	gallons

(½ pint hard oak varnish to each gallon of above.)

No. 3.

W. W. Resin	112	lbs.
Raw Linseed Oil	$\frac{3}{4}$	gallon
Zinc White	168	lbs.
Benzine	16	gallons
Mineral Naphtha	8	gallons

Have the zinc white ground in refined linseed oil.

No. 4.

W. W. Resin	112	lbs.
Zinc White	168	lbs.
Benzine	16	gallons
No. 2 Mineral Naphtha	8	gallons

$\frac{1}{2}$ pint hard oak varnish to each gallon of above.

PETRIFYING ENAMELS FOR DAMP WALLS.

These are made similarly to the above, but a little rubber varnish is often incorporated with the rosin varnish. Dissolve 4 ozs. good caoutchouc in benzine and add to every gallon or two gallons of the rosin varnish. Then grind in the zinc or other colour. For transparent enamels leave out the colour. To dry with flat surface (to be used for treatment of brick buildings or tiles), thin with coal-tar naphtha and reduce the rosin varnish.

RED ENAMEL FOR BRICKWORK.

	cwt.	qrs.	lbs.
W. W. Resin	1	0	0
Turkey Red	1	0	0
Whiting	0	2	0
Mineral Naphtha .... 16 gallons			
Benzine .... 8 gallons			

Process as above.

CHAPTER XIII.

METALLIC AND GOLD PAINTS AND ENAMELS.

Gold Paint Mediums.

The best and most satisfactory binding agent or vehicle for the decorative fluid known as "Gold Paint," "Gold Enamel," "Liquid Gold," etc., is an undecided matter, as there are two or three mediums that possess equal claims to supremacy. Very much depends upon the quality of the gold bronze powder employed. As these powders range in price from one to eighteen shillings per pound, we need say no more about this, except that two-and-six is ample to pay for a powder to make as good quality an article as is usually required. We advise the purchase from a respectable firm, and fair dealing will then result. Some powders are filled out with mica spangles, but this is no detriment, as the made up paint thereby gets extra brilliance and permanency; but the manufacturer may just as well add this himself, as it is cheaper than bronze powder, and he will save something in this way. Another filler is powdered mother o' pearl, which is much like mica in its results, yet hardly so brilliant. The maker may use a pale lemon or a rich deep bronze, just as he fancies will make his paint sell better. There are a score or so of shades, variations being obtained by admixture with silver or aluminium bronze powder, according to depth of shade desired—light or dark.

Then come the patent bronzes, heliotrope, tortoiseshell, in fact, all colours, these tints being brought about by appropriate mixtures of metallic oxides, etc., and variations in the heating processes.

We may mention that there is a bastard variety of patent bronzes now on sale, these getting their colour from aniline dyes. The metallic powders are not merely stained or coloured by these dyes, but the colour is thrown down or precipitated upon a certain quantity of bronze, exactly as in making artists' lake colours. In use, these answer fairly well, but not being so permanent as the true patent bronzes, are not worth so much, so care should be exercised when buying.

Aluminium bronze makes a good silvery paint, but not quite so brilliant as if silver bronze were alone used, but it is more durable. Some makers use an admixture. Though a good quality aluminium powder will cost 6s. per pound, the silver costs but 4s. per pound, but, the aluminium being much lighter, has three times the bulk, though it must not be thought that it will go three times as far as silver, as it does not cover so well. As we said before, an admixture will answer best.

PREPARATION OF THE MEDIUM.

When a paint turns green, it may be due to a bad bronze, or a medium containing acid, or to both causes, and, to avoid this, it is best to always first add lime or similar neutraliser of acid to the liquid, and then greening will not occur. This applies only to those mediums having varnish, gold size, etc., in the composition, and directions for doing this properly are set out hereunder :—

No. 1.

Genuine Turps.	$5\frac{1}{2}$ pints
Good Copal Varnish	$1\frac{1}{2}$ pints
Pale Terebine Drier	2 ozs.
Dry Slaked Lime	2 ozs.

Method.—Mix and shake well for a few minutes, then stand aside for a few days to rest and settle ; pour off the clear portion and mix with the bronze—7 lbs. of powder to 1 gallon of medium will be satisfactory.

Dry slaked lime may be had very cheaply of any builder. The wholesale chemists charge 4d. per lb., calling it by its chemical name of Calc. Hydras, Calcium Hydrate, etc.

No. 2.

Benzine	10 lbs.
Sheet Gutta-percha	4½ ozs.
Dry Slaked Lime	3 ozs.

Method.—Slake the lime with benzine, then stand; pour off the clear part and dissolve the gutta. therein. Strain afterwards, as gutta. usually contains a little grit.

A petroleum licence must be taken out where this one is made.

No. 3.

Transparent French Polish	6½ pints
Purified Fusel Oil or Amyl Acetate	1½ pints
Dry Slaked Lime	1 oz.

Method.—As before.

No. 4.

White Hard Spirit Varnish	3 gallons
Methylated Spirit	1 gallon
Dry Slaked Lime	1½ ozs.
Linseed Oil	1¼ ozs.

Method.—As before. The oil gives elasticity, as otherwise the spirit varnish is apt to granulate or crumble.

No. 5.

Methylated Spirit	1 gallon
Crushed Bleached Shellac	2½ lbs.
Crushed Sandarac	¼ lb.
Dry Slaked Lime	1 oz.

Method.—Shake spirit with the lime, stand, pour off the clear portion only, add the gums, and strain when dissolved.

No. 6.

Distilled Water	5	gallons
Shellac (Crushed)	5½	lbs.
Ground Borax	2½	lbs.

Method.—Boil until dissolved, then strain. According to the paint—whether gold or silver—the shellac may be either orange or the white (bleached) variety.

This is very cheap, but stands washing, etc.

The following is an acetone varnish medium, which has some good points :—

MEDIUM.

Gum Copal .... 1 part

Melt by heat and add—

Acetone .... 2 parts

PAINT FROM ABOVE.

Acetone Medium	1	part
Fusel Oil	1	part
Powder	⅓	part

Gold Enamel Paints and Metallic Bronze Paints in all Shades.

The bronze powders are usually bought ready for use, as their preparation is a difficult and tedious process. However, we append two recipes each for gold and silver alloys :—

GOLD.

No. 1.

Platinum	5	lbs.
Silver	3¾	lbs.
Copper	1¼	lbs.

No. 2.

	lbs.	ozs.
Copper	5	0
Pure Zinc	2	3
Cream of Tartar	1	4
Magnesia	0	5
Sal Ammoniac	0	2
Quicklime	0	1½

Melt the copper in a crucible, adding others as named. Then beat into foils and powder.

SILVER.

No. 1.

Copper	9¾ lbs.
Spelter	8½ lbs.
Nickel	2½ lbs.
Lead	1¾ lbs.
Tin	9 ozs.
Antimony	2 ozs.

Melt copper and add others in the order named. When made into foil or leaf, this alloy is brilliant and untarnishable.

No. 2.

Refined Nickel	16½ ozs.
Metallic Bismuth	3 ozs.
Sterling Silver	3 ozs.

Melt the nickel and bismuth twice, pour out, melt again, add silver, and pour out.

In addition to the foregoing metallic alloys, bronzes are also obtained as precipitates by mixing metallic oxides and solutions as follows :—

GOLD.

Zinc Sulphate Solution	11 lbs.
Manganese Nitrate Solution (12°—14° B.)	4 ozs.

Mix, collect and calcine the precipitate, the shade being darkened by calcining for a longer period.

PINK.

Zinc Sulphate Solution	11 lbs.
Ferric Nitrate Solution (28°—30° B.)	4½ ozs.

Mix the solutions, collect the precipitate, dry and calcine.

OLIVE GREEN.

Zinc Sulphate Solution	11 lbs.
Nickel Nitrate Solution (15°—16° B.)	3¾ ozs.
Nitrate of Silver Solution	⅛ oz.

BUFF.

Zinc Sulphate Solution	11 lbs.
Iron Sulphate Solution (28° B.)	3½ ozs.

OLD GOLD.

Zinc Sulphate Solution	11 lbs.
Nickel Nitrate Solution (15°—16° B.)	4 ozs.

We now proceed to give the processes for the paints themselves.

GOLD PAINTS.

No. 1.

Acetone	1 gallon
Bleached Shellac	4 lbs.
Dutch Bronze Powder	3 lbs.

Crush the lac, dissolve in the spirit, and add the bronze.

No. 2.

Benzol	5 gallons
Gutta-percha (Sheet)	2 lbs.

Shred the gutta. and dissolve in the solvent, then mix with—

Spirit Varnish (White Hard)	1 gallon
Bronze Powder	6¼ lbs.
Mother of Pearl (Powdered)	¾ lb.

No. 3.

The celluloid varnishes make most excellent gold paints.

Amylic Alcohol	1 pint
Amyl Acetate	1 pint
Celluloid (Sliced)	2 ozs.

Dissolve, and add—

Gold Bronze	5½ ozs.
Silver Bronze	½ oz.

No. 4.

Acetone	1 gallon
Celluloid (Sliced)	1 lb.
Bronze Powder	1¼ lbs.

Dissolve the celluloid in the acetone, then add the bronze.

No. 5.

Raw Rubber	2 ozs.
Benzol	1 lb.
Boiled Oil	1 pint
Turps.	1½ pints
Gold Bronze	1 lb.
Powdered Mica	¼ lb.

Shave the rubber and dissolve in the benzol, boil the oil, stir in the turps., add this gradually to the rubber solution, strain, adding the bronze last.

No. 6.

Benzol	1 gallon
Gum Elemi	2¼ lbs.
Bronze	1¾ lbs.
Mother of Pearl (Powdered)	4 ozs.
Acetate of Amyl	1 oz.

Add the gum and acetate of amyl to the benzol, when dissolved, add the bronze and mother of pearl, or powdered mica may be substituted.

No. 7.

Turps.	6 pints
Copal Varnish	1 pint
Slaked Lime (Dry)	½ oz.
Bronze Powder	2 lbs.
Mother of Pearl	2 ozs.

Mix the varnish and turps. at a gentle heat, then shake well with the lime, settle for a few days, pour off the clear portion, and mix in the bronze powder and pearl.

No. 8.

Fusel Oil	4 pints
Acetate of Amyl	4 pints
Nitro-Cellulose	1 lb.
Gold Bronze	1¼ lbs.
Silver Bronze	2 ozs.

This is one of the rapidly evaporating paints. Dissolve the cellulose in the first two, then add the bronzes, and shake up.

No. 9.

Sulphuric Ether	1 gallon
Acetone	½ gallon
Fusel Oil	½ gallon
Pyroxiline	9 ozs.
Castor Oil	2 ozs.
Canada Balsam	1½ ozs.
Gold Bronze	1¾ lbs.
Mother of Pearl (Powdered)	4 ozs.

Dissolve the pyroxiline in first three, then add castor oil and balsam, finally shaking up with the bronze and pearl. Is very elastic and quick drying.

To tint gold paints, use the following proportions of anilines for every 20 gallons of the paint. Any of the foregoing may be coloured in this manner (excepting Nos. 5, 6, 7; these having oil in their composition require oil soluble anilines). Dissolve the colours in a little spirit, then add to the paint and stir.

HELIOTROPE.

Fast Acid Violet 10 B.	56	grains
Azo-Fuchsine G.	56	grains
Acid Violet 4 B. Extra	42	grains

BRILLIANT GREEN.

Naphthol Yellow S.	7	drs.
Fast Light Green	3	drs.

DARK GREEN.

Acid Green G.G.	$8\frac{3}{4}$	ozs.
Fast Acid Violet 10 B.	$1\frac{1}{4}$	ozs.

EAU DE NIL.

Fast Green (Bluish)	112	grains
Orange H.B.	17	grains

SALMON.

Azo-Fuchsine S.	77	grains

CRIMSON.

Rhodamine B.	$2\frac{1}{2}$	ozs.
Azo-Fuchsine S.	$1\frac{1}{4}$	ozs.

OXFORD BLUE.

Fast Acid Blue B.	$4\frac{1}{2}$	ozs.
Fast Light Green	1	oz.

DARK BLUE.

Fast Acid Violet 10 B.	3	ozs.
Fast Green Bluish	3	ozs.
Acid Violet 4 B. Extra	$1\frac{3}{4}$	ozs.

BRILLIANT BLUE.

Fast Acid Blue B.	3¾ ozs.
Azo-Fuchsine S.	112 grains

CAMBRIDGE BLUE.

Fast Green Bluish	84 grains
Fast Acid Violet 10 B.	28 grains
Azo-Fuchsine G.	3 grains

PLUM.

Azo-Fuchsine G.	4 ozs.
Acid Violet 4 B. Extra	½ oz.

CARDINAL.

Azo-Cochineal	7½ ozs.

VIOLET.

Fast Acid Violet 10 B.	9½ drs.
Azo-Fuchsine G.	7 drs.
Acid Violet 4 B. Extra	7 drs.

GRASS GREEN.

Fast Yellow Extra	3½ ozs.
Fast Light Green	½ oz.

CHERRY.

Azo-Cochineal	5½ ozs.
Azo-Fuchsine G.	2¾ ozs.
Azo-Acid Violet R. Extra	3½ drs.

SEA GREEN.

Fast Green (Bluish)	1½ drs.

CORAL.

Azo-Fuchsine G.	112	grains

CHOCOLATE.

Bismarck Brown	9	ozs.
Nigrosine	½	oz.

SILVER GREY.

Fast Green (Bluish)	1	dr.
Fast Acid Violet 10 B.	½	dr.
Azo-Fuchsine G.	20	grains

LILAC.

Azo-Fuchsine S.	2	drs.
Fast Light Green	½	dr.

PURPLE.

Azo-Fuchsine G.	1¾	ozs.
Acid Violet 4 B. Extra	½	oz.
Azo-Cochineal	½	oz.

LAVENDER.

Azo-Fuchsine G.	77	grains
Fast Light Green	42	grains

Metallic Paints.

NO. 1.

Crystal Varnish	1	quart
Terebine	1	pint
Turpentine	½	gallon

Mix well together, add gold, silver or copper bronze powder to consistency required.

No. 2.

Japan Gold Size	1	quart
Terebine	1	pint
Turpentine	½	gallon

Mix well together and add bronze powder as before.

No. 3.

Naphtha Varnish	½	gallon
Benzine	½	gallon

Mix well together and add bronze powder as before.

The quantity of bronze powder required for above would be about 4 lbs. to the gallon. It is the usual thing to pack in 6d. and 1s. bottles, and is a good paying line. The bottles require shaking before use, as the bronze powder is not dissolved, but is only held suspended in the medium.

LIQUID GOLD.

	cwt.	qrs.	lbs.
White Shellac	0	0	6
Acetone	0	0	9
Gold, Silver, or Copper Bronze Powder	0	0	4½

This may require a little thinning out, which may be effected by the addition of more acetone.

Various shades of gold may be made by the addition of a little aniline dye, not much required, just sufficient of the kind necessary to give the tint required. This is a similar method to that already fully described.

ALUMINIUM PAINT.

Aluminium, when reduced to fine powder and mixed with a solution of gum lac in water, gives a metallic paint which covers well, and which may be tinted with aniline dyes soluble in water. The solution of lac is made as follows :—

Soda Crystals	8	ozs.
Borax	8	ozs.
Gum Lac	2	lbs.
Water	1	gallon

Boil the water and soda crystals and borax together, then add the lac, keep boiling till lac is dissolved. If this solution comes too thick, add more water and borax (1 oz. borax to 1 pint of water). To this solution, aluminium, finely powdered, is added in sufficient quantity to produce a paint sufficiently fluid to apply with a brush. This paint is brilliant, durable, and impermeable, and is suitable for wood, metals, paper, and cloth. If required more elastic, add 1 oz. glycerine to every gallon of lac solution.

GOLD ENAMEL PAINT.

Amyl Acetate	2	lbs.
Acetone	8½	ozs.
Celluloid	1	oz.

Method.—Dissolve celluloid in the acetone, covering over well. This takes about a fortnight. Then dilute with amyl acetate and strain. Finally mix with the bronze. About 2 lbs. will be required for above.

GOLD ENAMEL PAINT.

Benzine	1	gallon
Amyl Acetate	1	gallon
Acetone	½	gallon
Pyroxiline	12	ozs.
Gold Bronze	2½	lbs.

Dissolve the pyroxiline in the mixed liquids, then shake up with the bronze. During bottling, the bulk must be kept agitated, as the bronze settles quickly.

WATERPROOF LIQUID GOLD PAINT.

Dextrine	400	grains
Bichromate of Potash	1	grain
Bronze Powder	65	grains
Water, as may be required.		

GOLD BRONZE PAINT.

Cabinet Varnish	1	gallon
Turps.	6	gallons

Put about $\frac{1}{4}$ lb. quicklime to clear, and shake well before decanting. Mix with bronze as wanted.

GOLD PAINT SIMILAR TO WELL-KNOWN BRANDS IN BOTTLES.

Solvent Naphtha at 2s. 10d.	10	gallons
Gum Dammar at 74s.	80	lbs.
Gum Tragacanth at 32s.	10	lbs.
Celluloid	$\frac{1}{2}$	lb.

Mix with 11 lbs. bronze at 1s. 1d.

SILVER PAINT.

Same as above, but use silver bronze.

COPPER PAINT.

Dissolve in a boiler over a fire—

Trinidad Asphaltum	20	lbs.
Amber Resin	40	lbs.

When melted, add very carefully to avoid boiling over—

Trinidad Asphaltum	60	lbs.

Mix the above well together. Run into a cask containing 4 gallons black naphtha.

This must be done quite away from the fire, and little by little, stirring all the time. Then add—

Red Oxide Copper	1	cwt.
Indian Red	10	lbs.
Boiled Oil	1	gallon

Thin with varnish thinnings prepared as under :—

	cwt.	qrs.	lbs.
Amber Resin	3	2	0
Shale Naphtha	40 gallons		

Churn until dissolved.

CHAPTER XIV.

ANTIFOULING COMPOSITIONS.

These materials are treated of in this volume as they are now it may be said universally compounded of various metallic and pigmentary ingredients associated with a varnish base.

In proceeding to manufacture a good antifouling composition several important points must be kept in view. First, as to the objects for which these compositions are used. These may be said to be three in number, and are as follows :—

(1) To provide a general protective covering to the hull of the vessel and to prevent rusting and corrosion.

(2) To prevent the accumulation of seaweed and vegetable matter on the submerged portion of the ship.

(3) To prevent the adhesion of barnacles and other forms of animal life.

It is this last object for which in reality antifouling compositions are used, and according to the precise way in which the desired object is effected, these preparations may be divided into various classes.

In one class the action is one of simple poisoning, whereby the molluscs, crustacea, etc., absorb poison from the surface of the paint and are killed. It has been found, however, that the surface of such compositions rapidly loses strength, so that, finally, the animals and plants congregate in vast quantities on it.

In the other and more modern and approved class the paint gradually flakes away, carrying with it any living organisms that may have become attached to it, and exposing a fresh portion for the further protection of the hull.

There are three essential ingredients in an efficient antifouling composition :—

(1) *The pigment base.* Zinc white is usually considered the most satisfactory all round, its preservative and anti-corrosive properties being very great. Lithopone, red lead, and oxide of iron, especially the per-oxide (iron minium), are also good anti-corrosive bases.

(2) *The poisonous principle.* Formerly, mercury compounds were greatly used. Now, however, arsenic, salts of copper, and sugar of lead are chiefly in request. It goes without saying that the poison must be in such a form that it can be readily assimilated by the plants and animals.

(3) *The varnish, or medium.* This is perhaps the most important constituent of all, as unless it is of the correct nature the other constituents are unable to perform their functions.

Rosin varnishes are chiefly used, and the fluid medium is usuallly naphtha or some cheap spirit.

In the following recipes details as to the composition of the leading classes of antifouling compos. are provided :—

ANTIFOULING COMPOSITION.

Rosin	2	cwt.
Run in pan, take away from fire, and add—		
Wood Naphtha	10	gallons
Shale Spirit	10	gallons
When thoroughly dissolved add—		
Arsenic	10	lbs.
Linseed Oil	14	lbs.
Cyanide of Potass.	$\frac{1}{4}$	lb.

Mix in 2 cwt. of Indian red, and grind.

No. 2.

NON-DRYING COMPOSITION.

Castor Oil	20	gallons
Rape Oil	10	gallons
Linoleate of Manganese	14	lbs.
Sugar of Lead	28	lbs.

Melt the sugar of lead in 2 gallons of the above, dissolve the linoleate as well, and add—

Prussiate of Copper	28	lbs.
Venetian Red	8	cwt.
Arsenic	7	lbs.

This gives a red.

If Indian red is wanted add, instead of Venetian red,

Purple Oxide	8	cwt.

or, if green is wanted,

Middle Brunswick Green	11	cwt.

Sometimes prepared in buff colour, then—

	cwt.	qrs.	lbs.
Thin White Lead	2	0	0
Whiting	3	0	0
Barytes	1	1	0
Stone Ochre	0	1	14
Raw Umber	0	0	7

Or zinc oxide may be used in above.

No. 3.

	cwt.	qrs.	lbs.
Rosin	1	0	0
Dammar Dust	1	0	0
Shale Spirit .... 40 gallons			
Arsenic	0	0	11
Oxalic Acid	0	0	13

Run the rosin and dammar, when away from fire; add the spirit and acids.

If for stone colour add—

	cwt.	qrs.	lbs.
Sulphide of Zinc	1	2	0
Whiting	0	2	0
Oxford Ochre	0	0	7
Venetian Red	0	0	7

If for reds—

For Bright Red use 1 cwt. of Venetian Red.

For Indian Reds use 1 cwt. of Purple Brown.

Greens, seldom used—

	cwt.	qrs.	lbs.
Middle Green	1	0	0

ANTIFOULING COMPOSITION (ANOTHER METHOD).

VARNISH.

	cwt.	qrs.	lbs.
Trinidad Asphaltum	0	0	6
Common Rosin	0	0	10
Wood Tar	0	0	18
Coal Tar Naphtha ...... $3\frac{1}{2}$ gallons			

Process.—Melt the asphaltum and rosin together, add the wood tar, take away from fire, cool down, and stir in naphtha.

Next add—

	cwt.	qrs.	lbs.
Red Oxide of Copper	0	1	17
Turkey Red	0	0	3
Boiled Linseed Oil ...... $\frac{1}{2}$ gallon			

Thoroughly mix, and, if necessary, strain.

ANTIFOULING COMPOSITION FOR SHIPS' BOTTOMS.

The following are in general use, and may be varied to suit special requirements :—

NAPHTHA VARNISH.

No. 1.

	cwt.	qrs.	lbs.
Common Rosin	1	2	0
Raw Linseed Oil .... 1 gallon			
Mineral Naphtha .... 10 gallons			

No. 2.

	cwt.	qrs.	lbs.
Common Rosin	1	2	0
Raw Linseed Oil .... 1 gallon			
Shale Spirit .... 6 gallons			
Benzine .... 3 gallons			

No 3.

		cwt.	qrs.	lbs.
Common Rosin		1	2	0
Raw Linseed Oil	1 gallon			
Shale Spirit	6 gallons			
Benzine	6 gallons.			

Process.—The usual method of making these cheap rosin varnishes for antifouling compositions is to sweat the rosin and the oil together at a temperature of 400° F. Then cool down to 180° F. before adding the naphtha. Another method is to put all together in a churn and work the churn till all the rosin is dissolved. The former method is recommended for this varnish. Care should be exercised in the addition of the naphtha, which must be done away from any fire or gas.

The range of colours in these compositions is usually limited to blue, red, green, and grey. A frequent method is to take any of the ordinary stiff paints and thin for use with either of the above varnishes to a consistency for use, but it is better to take colours ground in turps. and work thoroughly into the varnish just before adding the naphtha, or to take dry colours, and perform the same process. The weight of these varnishes is very little over 9 lbs. to the gallon, and 8 gallons to $1\frac{1}{4}$ cwt. to $1\frac{1}{2}$ cwt. of colour will be found about the right proportion. These compositions require constant stirring during application, and it is the usual thing to apply the varnish as thinnings. The paints should all be sent out in tightly corked drums with labels attached, pointing out that the contents are highly inflammable.

There are also used large quantities of a composition composed of equal portions of paint and tallow. This mixture does not seem to be used so much as at one time, and where used is generally made on the spot.

The following are coloured compositions prepared on the above principles :—

LIGHT BLUE.

		cwt.	qrs.	lbs.
Zinc White, in Turps.		0	2	0
Whiting, in Turps.		0	2	0
China Clay, in Turps.		0	2	0
Chinese Blue Ground in Turps.		0	0	6
Varnish	8 gallons			

		cwt.	qrs.	lbs.
No. 3 White Zinc Paint		1	2	0
Chinese Blue in Turps.		0	0	6
Varnish	8 gallons			

		cwt.	qrs.	lbs.
Dry Zinc White		0	2	0
Dry Whiting		0	2	0
Dry China Clay		0	2	0
Chinese Blue in Turps.		0	0	6
Varnish	9 gallons			

DARK BLUE.

		cwt.	qrs.	lbs.
Brunswick Blue, *in* Turps.		1	2	0
Varnish	8 gallons			

		cwt.	qrs.	lbs.
Brunswick Blue Paint		1	2	0
Varnish	8 gallons			

		cwt.	qrs.	lbs.
Dry Brunswick Blue		1	2	0
Varnish	9 gallons			

RED.

		cwt.	qrs.	lbs.
Venetian Red, in Turps.		1	2	0
Varnish	8 gallons			

		cwt.	qrs.	lbs.
Venetian Red Paint		1	2	0
Varnish	8 gallons			

		cwt.	qrs.	lbs.
Dry Venetian Red		1	2	0
Varnish	9 gallons			

GREEN.

	cwt.	qrs.	lbs.
No. 2 Middle Brunswick Green, in Turps.	1	0	0
Whiting, in Turps.	0	2	0
Varnish .... 8 gallons			

	cwt.	qrs.	lbs.
No. 2 Middle Brunswick Green Paint	1	0	0
Whiting, in Oil	0	2	0
Varnish .... 8 gallons			

	cwt.	qrs.	lbs.
Dry No. 2 Middle Brunswick Green	1	0	0
Dry Whiting	0	2	0
Varnish .... 9 gallons			

GREY.

	cwt.	qrs.	lbs.
Zinc White, in Turps.	0	2	0
Whiting, in Turps.	0	2	0
China Clay, in Turps.	0	2	0
Lamp Black, in Turps.	0	0	2
Lime Blue in Turps.	0	0	7
Varnish .... 8 gallons			

	cwt.	qrs.	lbs.
No. 3 Zinc White Paint	1	2	0
Lamp Black	0	0	2
Lime Blue	0	0	7
Varnish .... 8 gallons			

	cwt.	qrs.	lbs.
Dry Zinc White	0	2	0
Whiting	0	2	0
China Clay	0	2	0
Lamp Black	0	0	2
Lime Blue	0	0	7

Special Compositions.

WHITE BASE.

	cwt.	qrs.	lbs.
Common Yellow Soap	0	3	0
Sulphate of Zinc	0	1	0

GREEN BASE.

	cwt.	qrs.	lbs.
Common Yellow Soap	1	0	0
Sulphate of Copper	0	1	16

Process.—Melt the soap in a pan, and when at 100° F. very gradually add the sulphate salt. Then stir well until the whole is of a solid white or green mass, as the case may be. When made, these compounds should be kept in wooden vessels; on no account in iron vessels.

ANTIFOULING COMPOSITIONS (SUNDRY COLOURS).

RED.

	cwt.	qrs.	lbs.
Venetian Red	1	0	0
Zinc White	0	1	0
Green Base	0	2	0
Arsenic	0	0	14
Naphtha Varnish .... 10 gallons			

PINK BOOT TOPPING.

	cwt.	qrs.	lbs.
No. 3 Zinc White Paint	1	2	0
Venetian Red	0	0	21
Naphtha Varnish ...... 9 gallons			

COPPER COLOUR.

	cwt.	qrs.	lbs.
Venetian Red	0	3	0
Zinc White	0	1	0
Green Base	0	0	21
Arsenic	0	0	7
Naphtha Varnish ...... 7 gallons			

GREEN.

	cwt.	qrs.	lbs.
Verdigris	0	2	0
No. 2 Middle Brunswick Green	0	2	0
Green Base	0	0	14
Zinc White	0	0	14
Arsenic	0	2	0
Naphtha Varnish ...... 9 gallons			

GREEN FOR WOOD VESSELS.

	cwt.	qrs.	lbs.
Green Base	1	0	21
Mineral Green	0	1	0
White Base	0	0	14
Zinc White	0	0	14
Manganese	0	0	7
Naphtha Varnish ...... 10 gallons			

GREEN FOR STEEL VESSELS.

	cwt.	qrs.	lbs.
Green Base	1	0	21
White Base	0	0	14
No. 2 Middle Brunswick Green	0	2	0
Mineral Green	0	1	14
Zinc White	0	0	14
Naphtha Varnish ...... 12 gallons			

TALLOW COMPOSITIONS.

WHITE.

	cwt.	qrs.	lbs.
Common Tallow	1	0	0
No. 3 Zinc White Paint	1	0	0

Grind together in a pan mill.

WHITE.

	cwt.	qrs.	lbs.
Dry Zinc White	0	3	0
White Lead	0	1	0
White Terra Alba	1	1	0
Common Tallow	0	2	0
Pale Pine Oil .... 2½ gallons			
885 Mineral Oil .... 2½ gallons			

PINK.

Venetian red to shade with either of above whites.

Process. –Melt the tallow, and stir in the various other ingredients.

The pink is used for ships' bottoms, and the white for coating steel and iron work when packing for export.

IRON SHIPS' COMPOSITION.

No. 1.

	cwt.	qrs.	lbs.
Red Lead	1	2	0
Red Oxide of Iron	1	1	0
Whiting	0	2	14
Arsenic	0	0	21

Grind in 4½ gallons boiled oil.

THINNINGS FOR ABOVE.

Shale spirit, 9 gallons. Run 71 lbs. of dark rosin in a pan, and 16 lbs. of dammar dust; take away from fire, and add the spirit; mix in the above pigments, and strain.

No. 2.

Mineral Turps.	10	gallons
Mineral Naphtha	12	gallons

Run 112 lbs. of dark rosin; carefully add the spirit to it. Then grind—

Indian Red	42	lbs.
Red Oxide	30	lbs.

in 2½ gallons of turps., with 1 quart of linseed oil. Add—

Green Copperas	21	lbs.
Creosote	3	gallons

No. 3.

WOOD.

Shale Spirit	10	gallons
Paraffin	5	gallons
Rosin	112	lbs.

Run rosin, add the spirits, and colour with—

	cwt.	qrs.	lbs.
Powdered Pumice Stone	0	0	14
Oxalic Acid	0	0	7
Arsenic	0	0	11

ground in 2 gallons boiled oil.

	cwt.	qrs.	lbs.
Red Oxide	0	3	20

Add—

Creosote .... $2\frac{1}{2}$ gallons

GREEN COMPOSITION.

	cwt.	qrs.	lbs.
Arsenical Green	0	2	14
China Clay	0	1	4

Grind in 3 lbs. eucalyptus oil, and 2 gallons linseed oil mixed. Then melt 91 lbs. of rosin over fire with 20 lbs. of Manilla dust. Add—

Shale	10	gallons
Paraffin	10	gallons
Liquid Ammonia	1	lb.
Arsenic	5	lbs.

COMPOSITION (WOOD OR IRON).

FIRST COATING.

Water	10	gallons.
Borax	9	lbs.
Dammar Dust	60	lbs.
Carbolic Acid	5	gallons
Red Oxide	28	lbs.
Oxalic Acid	3	lbs.

Warm the water to about 200 F.; put in the dammar and borax. When dissolved, add oxide and acid. Next add 11 lbs. sugar of lead (powdered).

MARINE PAINT.

Reduce hydro-silicate of copper from sulphate of copper by means of potash and glucose. Amalgamate the sediment with carbolic acid. Warm slightly; mix with linseed oil. Add mineral colours.

The following are useful for comparison:—

ANTIFOULING COMPOSITION.

(SPECIALITY).

A mixture of—

Paraffin Scale	10	parts
White Lead or Other Paint	7	parts
Bronze Green	6	parts
Light Green	1	part
Resin	2	parts
Arsenic or Cyanide or Oxide of Mercury	2	parts

PAINT FOR SHIPS' BOTTOMS.

Rosin	8	lbs.
Cologne Brown (Dry Colour)	1½	lbs.
Shellac	15	ozs.
Spirits of Wine	25	gills
Benzine	6	gills
Toluene	¼	gill
Pyridene	10	drops

As a finishing coat, a mixture of paraffin wax and white lead boiled together is applied hot.

ANTIFOULING PAINT.

Rosin	1	cwt.

Run this in pan, take away from fire, add—

Benzoline	4	gallons
Naphtha	4	gallons
Zinc White	½	cwt.

or same quantity of whatever colour required. Green must be mineral green, add the liquid to whatever consistency required. Add 7 lbs. arsenic to above quantities.

COPPER COLOURED ANTIFOULING.

Dissolve in jacketed pan, or ordinary copper—

Copper Sulphate		¼ cwt.
Soap	2 qrs.	12 lbs.

When thoroughly melted, add—

	cwt.	qrs.	lbs.
Zinc White	2	0	0
Red Oxide	4	0	0

Thin out with rosin varnish.

GREEN ANTIFOULING.

	cwt.	qrs.	lbs.
Brunswick Green	6	0	0
Zinc White	5	0	0
Arsenic	5	0	0

Thin out with rosin varnish and naphtha.

GREEN ANTIFOULING.

	cwt.	qrs.	lbs.
Mineral Green	0	2	21
Rosin	2	3	12
Zinc White	1	2	0
Naphtha	20 gallons		

CHAPTER XV.

SUNDRY VARNISH DERIVATIVES.

In this chapter we have colleeted a number of useful recipes, and processes for the preparation of materials which do not fall strictly under the headings of previous chapters. Some of these partake of the nature of paints, but they all agree in being composed of a varnish base and some require special boiling processes.

Coloured Japans.

WHITE JAPAN.

		cwt.	qrs.	lbs.
Dry Zinc White		1	0	0
Litho. Varnish	6 gallons			
Stout Terebine	½ gallon			
Turpentine	2 gallons			

BLUE JAPAN.

		cwt.	qrs.	lbs.
Ground Blue Black		0	2	0
Japan Gold Size	2 gallons			
Turpentine	6 gallons			

RED JAPAN.

		cwt.	qrs.	lbs.
Scarlet Chrome		0	2	0
Japan Gold Size	2 gallons			
Elastic Oak Varnish	4 gallons			
Turpentine	2 gallons			

Old Gold Size for Gilders.

Boiled Linseed Oil	16	ozs.
Venice Turps.	8	ozs.
Naples Yellow	5	ozs.

Dissolve the oil and Venice turps. together, and thin, stir, or grind in the Naples yellow.

Sometimes a proportion of ordinary gold size is added to the linseed oil, and ochre may be used to tint.

ANOTHER RECIPE.

Amber	8	ozs.
Gum Lac	2	ozs.
Drying Linseed Oil	8	ozs.
Turps.	16	ozs.

Dissolve the lac separately, then add the amber and the linseed oil very warm. When it has lost its heat, mix in relative proportions annatto, gamboge, terra merita, and dragons' blood.

Inasmuch as the following recipes are based on varnish processes, they have been included here.

Elastic Waterproof Compositions.

There are a goodly number of mixtures as bases for these paints, but it depends really upon the ultimate or particular use of the paint when deciding upon a medium. The following make suitable applications for horse, rick and sail cloths, tents, shop blinds, etc., etc. They will dry fairly quickly, and the coating will prove efficient for quite a considerable period, but two or even three coats should be laid on, and then the resistance to wet will last as long as the fabric of the sheet itself. The three colours given are the only ones in request, but any others would be produced by substituting the pigment desired for those in the recipes.

BLACK.

Boiled Oil	5	gallons
Turps.	4	gallons
Bone Black	17	lbs.
Yellow Soap	2½	lbs.
Chinese Blue	1	lb.

Process.—Cut up the soap, then boil in the oil, stirring frequently; then stir the blue in, and, when dissolved, mix or grind with black and turps.

The addition of a portion of varnish foots or livery stuff will impart more body, and give a more glossy coating.

Another type of black composition is the following :—

Boiled Oil	10	gallons
Rosin Spirit	8	gallons
Rosin Soap	¾	gallon
Crushed Asphaltum	40	lbs.
Prussian Blue	8	ozs.

Process.—Melt the asphaltum, steadily heating for a few hours to drive off the moisture, then turn the oil in, mixing well, then add the liquid rosin soap. After heating a little longer, and mixing well, add the blue, cool down, and thin with rosin spirit.

The rosin soap for the above will be made by dissolving 4 lbs. of carbonate of soda in 2½ gallons of water by boiling; then add 18 lbs. of crushed rosin, and continue heating until all is dissolved.

In addition to being satisfactory in use, these paints must be cheap; therefore, such things as shellac, rubber, etc., that would answer the purpose very well are not admissible on account of their price, but alumina soap may be advantageously substituted for the ordinary soap specified, if a little extra cost is not objected to. The following is a third way for turning out a black composition :—

Rosin Oil Varnish	5	gallons
Vegetable Black	22	lbs.
Chinese Blue	6	ozs.

Process.—Dissolve the blue in the varnish by heating carefully; then mix well or grind with the black.

The rosin oil varnishes vary in consistency, and it may be necessary to thin the paint a little when it is ground.

No soap is required in the above to make it elastic, nor is any drier necessary, as the varnish being a compound of soap, and containing manganese and turps. supplies these in an easily assimilated form.

GREEN (EAU DE NIL).

Rosin Oil Varnish	2	gallons
Boiled Oil	2	gallons
Turps.	2	gallons
Middle Brunswick Green	10	lbs.

Process.—Mix liquids and grind with pigment; then strain.

BUFF.

Boiled Oil	5	gallons
Rosin Spirit	5	gallons
Thick Rosin Oil Varnish	2	gallons
Yellow Ochre, in Oil	56	lbs.

Process.—Mix, grind, then strain. This is the ordinary yellowish or khaki colour much favoured as van covers.

Waterproof Composition.

This is applied with a brush after the manner of a varnish, which it really is. It is used for hats, capes, leggings, cart covers, loin cloths, etc., etc. Usually put up in 1 lb. lever lid tins, or pint cans.

No. 1.

Methylated Spirit	3	gallons
Garnet Shellac	6	lbs.
Camphor	1	lb.
Vegetable Black	1	lb.
Prussian Blue	6	ozs.

Process.—Crush shellac and camphor, dissolving in the spirit; rub up the colours with a little of the liquid; stir in and strain.

No. 2.

Brunswick Black	3	gallons
Boiled Oil	1	gallon
Ground Black Resin	4	lbs.
Lampblack (Ground in Turps.)	1	lb.

Engine Enamel Paints.

These paints are specially adapted for application on engines, machinery, and in stokeholes, and, in fact, all surfaces exposed to a high temperature. Very few materials used in the ordinary way meet these requirements. Many pigments change colour and some are destroyed on a steam chest or cylinder cover in a few minutes. Raw oils shrivel and blister, peeling off in a short time. Only those materials which have been carefully examined under stringent conditions are eligible in these respects. The following recipes will be found to give satisfaction. They are not cheap paints, but should have a ready sale, as they are really cheapest in the end. They stand washing and scrubbing, and as long as the temperature does not exceed 650° F. are practically indestructible. As might be expected, the oil or varnish base has much to do with the success of these paints in active use. We therefore append full working details for the preparation of the boiled oil.

SPECIAL OIL FOR ABOVE PAINTS.

Good Baltic linseed oil is heated in an enamelled pan. Slowly get the temperature up to 600° F., and maintain it at that for several hours until the inflammable fumes cease to pass over. These fumes must be conveyed by a cover and flue from the boiling oil to a fire and burnt, as they are extremely irritating. If carefully carried out, with constant stirring to prevent the bottom of the oil from carbonising, the product will be quite pale in colour and thick when cold. No driers are needed if a pale oil for light colours is desired. Manganese in small lumps and suspended in a wire basket may be used to produce a stronger oil for dark colour. The fire must be well attended to, as if the heat is excessive the oil will be darkened.

The varnish should be an elastic copal, but drying hard ultimately.

LIGHT BLUE.

		cwt.	qrs.	lbs.
Zinc White		1	0	0
Ultramarine Blue		0	0	21
Copal Varnish	6 gallons			
Special Oil	6 gallons			
Turpentine	1½ gallons			

DARK BLUE.

		cwt.	qrs.	lbs.
Ultramarine Blue		1	0	0
Copal Varnish	6 gallons			
Special Oil	6 gallons			
Turpentine	1½ gallons			

VERMILION.

PALE.

		cwt.	qrs.	lbs.
Genuine Pale Vermilion		1	0	0
Zinc White		0	0	14
Copal Varnish	5 gallons			
Special Oil	5 gallons			
Turpentine	1½ gallons			

DARK.

		cwt.	qrs.	lbs.
Genuine Dark Vermilion		1	0	0
Copal Varnish	5 gallons			
Special Oil	5 gallons			
Turpentine	1½ gallons			

Vermilionettes must not be used; they turn brown with heat.

BRIGHT RED.

		cwt.	qrs.	lbs.
Pure Light Indian Red		1	0	0
Copal Varnish	6 gallons			
Special Oil	6 gallons			
Turpentine	1½ gallons			

PURPLE.

		cwt.	qrs.	lbs.
Purple Oxide		1	0	0
Copal Varnish	5 gallons			
Special Oil	5 gallons			
Turpentine	1½ gallons			

LIGHT GREEN.

		cwt.	qrs.	lbs.
Zinc White		0	3	0
Ultramarine Green		0	1	14
Copal Varnish	6 gallons			
Special Oil	6 gallons			
Turpentine	1½ gallons			

GREEN.

		cwt.	qrs.	lbs.
Ultramarine Green		1	0	0
Copal Varnish	5½ gallons			
Special Oil	5½ gallons			
Turpentine	1½ gallons			

No acid ingredients must come in contact with ultramarine green, and an oz. bicarbonate of soda to the lb. of green may be added to neutralise acidity in oils, etc.

BROWN.

		cwt.	qrs.	lbs.
Burnt Turkey Umber		1	0	0
Copal Varnish	8 gallons			
Special Oil	8 gallons			
Turpentine	1½ gallons			

BLACK.

		cwt.	qrs.	lbs.
Black Oxide of Iron		1	0	0
Copal Varnish	7 gallons			
Special Oil	7 gallons			
Turpentine	1½ gallons			

Process.—Warm the oil to 200° F. and grind with the colours and turps., and while still warm add the varnish. Pack into drums at once. It cannot be ground satisfactorily cold, owing to the thickness of the oil. The above quantities are ready for use.

Damp-proof Compositions Made by Varnish Processes.

Stone Preserving Composition.

SPECIAL GUM COMPOUND FOR USE IN THE STONE LIQUIDS.

	cwt.	qrs.	lbs.
Raw Linseed Oil .... 6 gallons			
India Rubber	0	0	6
Common Resin	0	0	6
Paraffin Wax	0	2	0

Process.—Dissolve the rubber in the oil by gentle heat and with continual stirring. When the rubber is dissolved, melt the resin and stir in. Break up the wax and stir well in. When all is thoroughly mixed, strain through a coarse sieve while hot. The heat during this process should not be excessive, or the rubber loses some of its elastic qualities.

It facilitates the manufacture of this compound if it is made a rule to have a stock of rubber cut up and soaked in linseed oil always ready. It will then readily melt at 212° F.

THINNING LIQUID.

Special Gum Compound	6 gallons
Petroleum	9 gallons
Turpentine	1 gallon
Spirits of Tar	½ gallon
Raw Linseed Oil	½ gallon
Terebine	2 gallons

COMPOSITIONS.

TRANSPARENT WHITE.

	cwt.	qrs.	lbs.
Thinning Liquid ...... 10 gallons			
Dry Zinc White	0	0	7

FREESTONE COLOUR.

		cwt.	qrs.	lbs.
Thinning Liquid	10 gallons			
Dry Zinc White		0	0	7
Dry Oxford Ochre		0	0	0½

PORTLAND STONE COLOUR.

		cwt.	qrs.	lbs.
Thinning Liquid	10 gallons			
Dry Zinc White		0	0	7
Plumbago		0	0	0½

BRICK RED.

		cwt.	qrs.	lbs.
Thinning Liquid	10 gallons			
Dry Zinc White		0	0	2
Powdered Spanish Brown		0	0	5

With these stone liquid compounds it is possible to preserve a stone front without altering its appearance, or it can be renovated to appear new without any glossy or painted look, its stony aspect not being altered by the liquid after it is dried in, so that it can be used when paint is entirely out of the question. Before applying the liquid dirty surfaces should be brushed clean with wire brushes.

BLACK COMPO.

(Not used alone but employed in other preparations.)

		cwt.	qrs.	lbs.
Black Resin		0	1	12
Resin Oil	18 gallons			

Boil together till the resin is dissolved; strain while hot in tank.

SPECIAL COMPO.

No. 1.

This also is only used in other preparations (see later).

		cwt.	qrs.	lbs.
Black Compo.	1¼ gallons			
Yellow Resin		0	1	2
Turps.	4¼ gallons			
Paraffin Oil	3¾ gallons			
Spirits of Tar	3 gallons			

Melt the resin, stir in the black jelly, then the paraffin, then the turps., and last, the spirits of tar—all done away from any fire or lights. Mix well, and strain into a tank having a tight cover.

SPECIAL COMPO. THINNINGS.

No. 1.

Special Compo., No. 1	3	gallons
Paraffin Oil	3	gallons
Spirits of Tar	3	gallons
Caoutchouc Oil	1	gallon

Warm the compo. and caoutchouc oil together; put in the paraffin, and then the spirits.

STONE LIQUID THINNINGS.

The Stone Liquid Itself (see below) ..	1	gallon
Special Compo. Thinnings, No. 1	3	gallons

Mix well and pack in drums. Must not be used to thin anything else.

TRANSPARENT STONE LIQUID.

No. 1.

	cwt.	qrs.	lbs.
Paraffin Wax	0	0	4
Genuine Canada Balsam	0	0	$0\frac{1}{2}$
Caoutchouc Oil .... $\frac{1}{2}$ gallon			
Mixed Turps. .... 12 gallons			

Melt the wax and stir in the caoutchouc oil; take away from fire and stir in the balsam and the turps. Use for indoors, where the smell from No. 2 would be unpleasant. May be used for outdoors.

No. 2.

Spirit Copal Varnish	1	gallon
Methylated Spirit	3	gallons

Mix well. Used as No. 1 indoors only in cases of emergency, for quick drying. Dries very quickly and hard.

No. 3.

Encaustic Jelly	1 gallon
Perfume (Nitro Amyl)	1 drachm

Mix warm; thin with hot water for use. Used in preparing walls for encaustic, varnishing encaustic, thinning encaustic, making distemper, etc.

OPAQUE WHITE.

		cwt.	qrs.	lbs.
White Encaustic Jelly	3½ gallons			
Zinc White		0	1	4
Best Barytes		0	3	12.

Warm and mix; thin with No. 3 transparent liquid and water. For interior walls, ceilings, etc. May be varnished with No. 1, No. 2, or No. 3 transparent liquid, but looks best unvarnished, though not quite so waterproof. It is more adapted for decoration than actual waterproofing, though it will stand where common distemper would speedily perish with the damp.

TRANSPARENT WHITE.

White Encaustic Jelly	4½ gallons
Hot Water	1½ gallons
Carbolic Acid	6 ozs.
Glycerine	¼ oz.

Warm the jelly, mix carbolic acid and glycerine together, and mix with part of the water, and then mix the whole together. For use indoors where damp has caused the paste and size on walls to decay, making the room smell mouldy. Wash the walls well first with hot water and a little soda, then put on a coat or two of transparent white and follow with one of opaque white, or any other encaustic, or paper, paint, or distemper, as may be required. This will kill the bad smell, make the wall dry, and prevent mould. Should it be in a very bad state, from house being unoccupied or damp, after washing and drying well use No. 1 transparent liquid or Special Compo. thinned with a mixture of 2 parts paraffin oil and 1 part tar spirit; soak well in and let dry before papering or painting, or finish in the stone liquid, or finish in encaustic.

ENCAUSTIC JELLY.

	cwt.	qrs.	lbs.
French Medal Glue	0	0	16
Soap	0	0	2½
Alum	0	0	2½
Carbolic Powder	0	0	0¼
Water ....12 gallons			

TRANSPARENT LIQUID.

No. 1.

	cwt.	qrs.	lbs.
Silicate, 20° B.	0	0	5
Special Compo. No 1......10 gallons			
Caoutchouc Oil	0	0	1¼
Barytes	0	1	9
Zinc White	0	0	8

Mix the liquids, and mix the powder to paste with part of the liquid; then mix all together and strain. Use for inside or outside. It dries much quicker inside.

FREESTONE LIQUID.

	cwt.	qrs.	lbs.
Silicate, 20° B.	0	0	3¼
Special Compo. No. 1.....9½ gallons			
Caoutchouc Oil ....10 ozs.			
Brown Barytes	0	2	19
Zinc White	0	0	17
Oxford Ochre	0	0	2

Mix as before. Thin if necessary with stone liquid thinnings. Used for inside or out. Have the walls dry and well brushed down, so that the liquid may penetrate well. Keep stirred during use, or much of it will be left at the bottom of the can.

PORTLAND STONE.

	cwt.	qrs.	lbs.
Silicate, 20° B.	0	0	3½
Special Compo. No. 1 .. 9½ gallons			
Caoutchouc Oil .... 10 ozs.			
Brown Barytes	0	2	19
Zinc White	0	0	17
Manganese Black	0	0	1½

Mix and use as before.

BRICK RED.

	cwt.	qrs.	lbs.
Silicate, 20° B.	0	0	3½
Special Compo. No. 1 .. 10 gallons			
Caoutchouc Oil	0	0	1
Brown Barytes	0	2	24
Red Oxide	0	0	27
Purple Oxide	0	0	1½
Zinc White	0	0	17

Mix and use as before.

CHOCOLATE.

	cwt.	qrs.	lbs.
Special Compo. No. 1 .. 8 gallons			
Zinc White	0	0	7
Purple Oxide	0	0	3
Red Oxide	0	0	20
Brown Barytes	0	1	2

Mix and use as before.

The transparent liquids are recommended for outside work in preference to the above.

Roof Stopping.

BEST.

	cwt.	qrs.	lbs.
Common Rosin	0	2	0
Paraffin Wax	0	0	20
Calcined Flint	0	1	22
Raw Linseed Oil .... 3 gallons			
Red Lead	0	0	3
Wood Tar	0	0	3
Slaked Lime	0	0	3

Process.—Boil the oil with the red lead, melt in the rosin and the wax. Heat the tar and lime together, add to the oil mixture, then add the calcined flint and thoroughly mix.

LIGHT.

	cwt.	qrs.	lbs.
Common Rosin	0	1	14
Raw Linseed Oil .... 2½ gallons			
Stout Terebine .... ¼ gallon			
Paraffin Wax	0	0	14
Powdered Lime Stone	0	1	0

DARK.

	cwt.	qrs.	lbs.
Common Rosin	0	1	14
Raw Linseed Oil .... 2½ gallons			
Stout Terebine .... ¼ gallon			
Paraffin Wax	0	0	4
Powdered Slate	0	0	14
Gas Tar	0	0	14

Process.—Melt the rosin and wax together and stir in the oil and terebine; then add the powdered slate and gas tar, and thoroughly stir.

For stopping roofs, melt in a ladle, and pour along the cracks and run well in with a plumbers' soldering iron. For walls, melt, and mix with some of the material of the wall, stone, or brick, as the case may be, crushed very fine and applied hot, as putty. When cold, scrape off the superfluous material.

This is very useful for mending slate roofs and cisterns, and lead roofs, gutters, parapets, balconies, window sills, etc., and also as a damp course.

Absolutely impervious to water, and is not affected by solar heat or the most intense frost; it forms a perfect cure for leaky roofs.

Elastic Roof Paint.

	cwt.	qrs.	lbs.
Gum Shellac	0	0	7
Soda Crystals	0	0	1
Water .... 12 gallons			

Process.—Place in a pan over fire, keep at a good heat but do not boil; when all is dissolved should be in from 1 to 2 hours; remove and keep in cans tightly corked.

FOR USE.—Add 1 gallon of above to 1 gallon ot ordinary paint. It will not interfere with consistency or covering power of the paint. Is weatherproof and suitable for both wood and metal.

BLACK "AMERICAN ROOF PAINT."

To any quantity of coal tar add as much lime water as it will stand; it is then ready for use.

If required with a lustre surface, add a small quantity of a good Brunswick black.

BROWN "AMERICAN ROOF PAINT."

Proceed as for black, adding strong Venetian red to shade required.

Damp-proof Composition.

Mineral Naphtha	20	gallons
Mineral Turps.	10	gallons
Rosin	1	cwt
Dammar Siftings	¼	cwt.

Run the rosin; when melted, take away from fire and add the turps. and naphtha; dissolve the dammar siftings and mix in. When thoroughly mixed, add 2½ gallons of boiled oil. Strain.

FOR RED.—Use to every gallon of liquid 1½ lbs. of Venetian red.

FOR WHITE.—Use 1½ lbs. of sulphide of zinc to every gallon.

FOR GREEN.—Use 2 lbs. of Deep Brunswick green to gallon of liquid.

FOR BUFF.—Use 1½ lbs. of sulphide of zinc, and ½ lb. of Oxford ochre to every gallon of spirit.

FOR DRAB.—Use 1½ lbs. of sulphide of zinc, ¼ lb. of raw Turkey umber, and ½ lb. of Oxford ochre.

Coating for Iron Pipes.

Pitch	1	cwt.
Coal Tar	5	cwt.
Creosote Oil	5	cwt.
Linseed Oil	1	cwt.
Rosin	14	lbs.

(Proportions of tar and creosote can be varied.)
Melt at 300° to 350° F., and dip in the iron pipes.

COMPOSITION FOR PRESERVING IRON PIPES.

Coal Tar	60	parts
Pitch	40	parts
Linseed Oil	6	parts
Rosin	5	parts

Heat together to 300° F., and dip in the pipes.

Extra Quick Enamel Paints

FOR BRICK WALLS, DAMP PLACES, HEADS OF PETROLEUM BARRELS, ETC.

The following describes the preparation of a petrifying preparation for stone walls, which is used with satisfactory results.

These have a large sale and, though very cheaply prepared, are often sold at high prices under very fanciful names, such as electric paint, instantaneous enamel, brilliant glaze, etc., etc.

The base of all is rosin varnish, which may be a turpentine varnish or a coal tar naphtha varnish.

TURPENTINE VARNISH PROCESS.

Turps.	5	gallons
G. Rosin	50	lbs.

Shake up till dissolved.
This gives the transparent variety.

FOR COLOURED.

Grind the above with zinc white for white, ultramarine for blue, red oxide for red, adding, if necessary, a little turps. Thin for use with varnish as above.

For flat drying thin out after grinding with turps. only; or a mixture of turps. and benzine.

These preparations will sell at 8s. 6d. to 10s. per gallon.

NAPHTHA VARNISH PROCESS.

Substitute coal tar naphtha (which costs 1s. to 1s. 3d. per gallon) for turps. Prepare the varnish as above, but the varnish so prepared is of no use except to grind colours in; it cannot be used by itself.

For white, grind oxide of zinc or a mixture of oxide of zinc and whiting (according to cost desired) with the varnish. Tint with ultra. and celestial blue for a blue compo., and with red oxide for red.

Zinc oxide should be present in all the tints, as it helps the varnish to bind.

NOTE.—Attention is directed to the IMPORTANT NOTICE facing page 1 of this volume.

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